C.M.I.
19-54

FORESTRY ABSTRACTS

IMPERIAL FORESTRY BUREAU

VOL. 5. No. 1 1943

PUBLISHED BY THE IMPERIAL FORESTRY BUREAU, OXFORD

CONTENTS

	PAGE NO.
SOME 1942 PRESS COMMENTS ON RUBBER PRODUCTION IN LATIN AMERICA	1
COMMERCIAL POSSIBILITIES IN BRAZIL'S FOREST WEALTH	5
ABSTRACT SECTION:	
General Forestry	7
Fundamental Natural Laws of the Forest	10
Silviculture	25
Forest Utilization. Forest Technology	33
Forest Injuries and Protection	58
Mensuration. Increment. Yield	66
Management. Working Plans. Surveys	67
Forest Economics, Valuation, and Finance	69
Administration	69
Forest Policy	70
Notes from the Daily and the Non-Technical Press	75

FORESTRY ABSTRACTS

VOLUME 5 1943 NUMBER 1

SOME 1942 PRESS COMMENTS ON RUBBER PRODUCTION IN LATIN AMERICA*

THE MOBILIZATION OF RESOURCES

IT has been said, with reference to the United States' programme for the development of Latin American rubber, that not only must natural rubber 'carry most of the load over the fateful military crossroad of 1942, but every pound is pretty nearly priceless for mixing with the new synthetic rubber production' (*Fortune*, June, 1942). There has, however, been a considerable variety of opinion as to the potentialities of Latin America as a source of crude rubber, with reference to such important questions as the amount that can be produced and its possibilities in competition with the East Indian product under normal conditions. Though the development of Latin American rubber is desirable in order to supply United States' requirements and to help satisfy the needs of the producing centres, there are frequently problems of labour, health, transport, equipment, capital, price and post-war policy that have to be decided before wild rubber can be gathered or plantations developed. However, strenuous efforts have been made in recent months to overcome the obstacles to the revival of the Latin American rubber industry, which many years ago was eclipsed by the plantations of the East, and production has again been started in some zones and intensified in others.

According to a *Report* of the Foreign Policy Association (quoted in *Christian Science Monitor*, 16 March, 1942) the United States Department of Agriculture hopes that Latin America will ultimately produce from one-quarter to one-third of the rubber consumed in the United States, or enough to emancipate the country from exclusive reliance on the Far East. But it is evident that in the immediate future the United States can hope to obtain only a very much smaller proportion of its rubber needs from Latin America. Dr. E. N. Bressman, the Director of the Agricultural Division of the Office of the Co-ordinator for Inter-American Affairs, told a Senate Committee that 90,000 tons of rubber could be obtained annually by the United States from Latin America, but that it would be a tremendous task to do so. He calculated that 50,000 tons of Hevea (*Hevea brasiliensis*) rubber could be obtained from the Amazon Basin; 30,000 tons of Castilla (*Castilla elastica*) rubber from the north of South America and Central America and 10,000 tons of Guayule (*Parthenium argentatum*) from Mexico. Efforts have been made to conclude contracts with all the rubber-producing countries in order that the United States would acquire their entire output (*Excelsior*, 6 June, 1942).

Some rubber experts apparently think that the Amazon Basin could produce 75,000 tons a year. However, the production of such a quantity involves a systematic organization, the migration of thousands of workers to the production areas, the transport of workers and equipment, and health and housing projects. The size of the task of equipping the tappers was illustrated in a statement by Dr. Bressman that the equipment necessary for starting work in Brazil included 5,000 tapping cups, 5,000 machetes, 10,000 files, 5,000 shot-guns, 250,000 cartridges, and 3,000,000 anti-malaria tablets. It has been estimated that there are at present some 40,000 tappers at work in the Amazon Basin, and it was hoped that 20,000 more would be equipped in 1942. In this and other areas, the United States has given technical and financial aid, and has already agreed to contribute substantial sums for rubber development in Brazil, Peru, Bolivia, Colombia, and Mexico (*Universal*, 30 July, 1942). With regard to transport, it is reported that the construction of roads to carry rubber produced in Ecuador, Peru, and Brazil to shipping ports is under consideration (*Nación*, 31 July, 1942), and there have been unconfirmed reports that the United States intends to ship Peruvian and Brazilian rubber by the Pacific route. Recently it has been reported that, with United States assistance, 11 airports are being constructed from Mexico to Brazil to make possible the shipment of rubber by air from areas where, in the past, transport difficulties have prevented the exploitation of wild rubber trees. The use of amphibian boats has also been proposed in this connexion.

As to the development of plantation rubber, an official of the United States Department of Agriculture said at the Inter-American Agricultural Conference in July, 1942, that 25,000,000 seedlings of Hevea had been planted under the programme sponsored by 12 countries of Tropical America and the United States, although four to five years would be required before significant quantities of rubber could be obtained. It was also stated that three research centres were now at work, and that each country had one or more propagating nurseries. (In 1940 the United States Congress voted $500,000 to enable the Department of Agriculture to experiment and investigate in this field). Demonstration centres were to act as links between research workers and growers, and with these a beginning had been made (*Christian Science Monitor*, 14 July, 1942). Following earlier surveys of American rubber-producing areas, a group of United States rubber experts visited Brazil, Bolivia, Colombia, Ecuador, Peru, and Central America in 1942 to study problems relating to both the production of plantation rubber and the gathering of wild rubber. Moreover, a Bill for the development of Guayule rubber has now been passed by the United States Congress to authorize the Department of Agriculture to plant and develop up to 75,000 acres in the western hemisphere (*New York Herald Tribune*, 1 March, 1942).

* From reports supplied through the courtesy of the Foreign Office Research Department.

SOME 1942 PRESS COMMENTS ON RUBBER PRODUCTION IN LATIN AMERICA

The Inter-American Agricultural Conference passed a recommendation that everything should be done to develop rubber production by exploiting to the full plants and trees producing wild rubber and by planting species that produce appreciable quantities of rubber in the shortest possible time. Progress made in propagating Hevea trees should be consolidated in centres set up through the co-operation of the Governments concerned. Instruction should be given in the most rational systems of exploitation, colonization should be planned on the basis of rubber cultivation by countries desiring it, and the American countries should study the possibility of concluding bilateral or multilateral agreements to guarantee the sale of the rubber produced in those countries and to prevent a future shortage of so essential a material. In an address to the Conference, the United States Secretary of Agriculture said that the policy laid down at Rio for increasing production by means of agreements, which provide for acquisition over long periods at remunerative prices and for post-war readjustment so as to guarantee the continuance of adequate production, had been put into practice, and agreements had been signed with various countries in possession of rubber trees. The United States Rubber Reserve Corporation had concluded agreements with various countries in which wild rubber trees grew, for the purchase of all the rubber they could produce for export in the next five years (*Nacional*, 16, 7 July, 1942). Such agreements have been signed with Brazil, Bolivia, Colombia, Ecuador, Peru, Costa Rica, Guatemala, Honduras, Mexico, Nicaragua, and Panama. Negotiations were also opened with El Salvador (*Imparcial*, 22 June, 1942).

Private concerns as well as the United States authorities have been engaging in the development of Latin American rubber. The United Fruit Company announced in July, 1942, that it had adopted as a fundamental policy the development in the western hemisphere of natural products, including rubber, formerly imported from the Far East. A start will be made by the Company in Guatemala, Honduras, Nicaragua, Costa Rica, and Panama. In the previous month the Company had appropriated money for the establishment of a 1,000-acre Hevea plantation in Honduras, and an agricultural school was to be opened by the Company in that country to teach Central Americans how to grow these crops (*New York Times*, *Christian Science Monitor*, 20 July, 1942). The vast Ford plantations in Brazil and the experiments made by the Goodyear Rubber Company with high-yield Hevea trees in Panama and Costa Rica are instances of the interest shown by large United States concerns in Latin American rubber.

South America.

It is hoped to produce rubber even in Argentina, which is far from the Amazonian rubber zone. In March, 1942, the Minister of Agriculture for Argentina announced that he was studying the possibility of growing Guayule and that a representative had been sent to Mexico to investigate the most suitable method. More recently a Bill providing for the creation of an Institute of Industrial Crops was sent to Congress by the Executive. The intention is to stimulate production of industrial crops, which include rubber (*Nación*, 28 June, 1942).

Bolivia signed an agreement with the United States Rubber Reserve Company in July, 1942, by which the latter is to purchase for the next five years all rubber produced except what is necessary for internal consumption and minor exports to other countries. The price is to vary with quality up to 45 cents a pound and the Company will advance $2,125,000 for the scientific development of production, road-building, improved sanitary conditions in rubber zones, and the raising of workers' pay. The contract is for 1,500 tons a year and a bonus will be paid for rubber received in excess of that amount. It is expected that the output will be about 2,000 tons in 1942, and 2,500 to 3,000 tons in 1943 (*Nación*, *New York Herald Tribune*, 16 July, 1942). The agreement with the United States would appear to have been accepted in preference to an Argentine offer, presumably because the former would fulfil Bolivian aspirations more fully than the latter (*Razón*, 3 July, 1942, *Diario*, 31 May, 1942).

By an agreement with the United States signed in March, 1942, Brazil undertook to sell all rubber not required for domestic needs for five years, and was to receive an Export-Import Bank loan of $5,000,000 for use in improving production and general welfare in Amazonia. The agreement has now come into force and steps have been taken to implement it, such as the moving of workers to the rubber zone and the establishment of a Rubber Credit Bank to control and develop rubber production and trade.

The Amazon region of Brazil necessarily occupies an important position in plans set on foot by the United States to increase South America's output of rubber, but the fact that output will be extremely small in relation to the needs of the Americas has been emphasized by an estimate made in the United States, that that country would receive no more than 10,000 to 13,000 tons of rubber from the whole of Latin America during 1942 and possibly 40,000 tons in 1943 and 90,000 in 1944 (*United States News*, 21 August, 1942). In one of a number of articles which appeared in the summer of 1942 in the United States Press, explaining how difficult it was for Latin America to produce more rubber, a United States correspondent in Brazil quoted a Belem estimate that Brazil's 1941 output of 19,000 tons might be increased in 1942 to 25,000 (about 15,000 of which would be available for the United States) and in 1943 to 30,000 tons at most (*Chicago Daily News*, 15 August, 1942). A contributor to *Correio da Manhã* (25 July, 1942) was doubtful whether, given the present system of labour in Amazonia, it would be possible to increase output, at whatever price, to 30,000–40,000 tons within two years.

Arrangements made with the Rubber Reserve Company to encourage the gathering of wild rubber are reported to have met with difficulties of finance and organization. It was suggested that, instead of bureaucrats, business men with a knowledge of the local conditions should have been put in charge (*Noite*, 4, *Chicago Daily News*, 15 August, 1942). New methods and attempts at greater efficiency did not easily fit in with the existing system by which the primary producer was exploited by numerous local middlemen to the extent that it was not worth his while to produce more than was absolutely necessary for his livelihood (*ibid.*). A Decree published in October, 1942, places on record the right of the Rubber Credit Bank (which had held its first meeting in August) to carry out the final stage of dealings in all rubber produced in Brazil, and to take over all rubber that is turned aside from its normal channels and destination. The same Decree grants six years' tenure to 'seringalistas' (persons who control the gathering of rubber); fixes the proportions in which profits are to be divided between the owner of the

land, the 'seringalista' and the 'seringueiro' who gathers the rubber; and makes other regulations to protect the 'seringueiro' (*Jornal do Commercio*, 18 October, 1942).

It has been alleged that the output of the Acre territory could be raised in seven months to twice its present level of 7,000 tons if 7,000 more workers and better transport could be provided (*Correio da Manhã*, 25 August, 1942). Some 6,000 people, probably including the families of workers, have so far been brought to the Amazon rubber area from Ceará. For the protection of these and other settlers, the United States has agreed to spend $5,000,000 on health services, and Brazil 5,000 contos* in 1942 and a larger sum in 1943. Under a contract signed on 17th July, 1942, a sanitary unit with headquarters in Belem is starting on this enormous task (*New York Times*, 10, *Chicago Daily News*, 15, 18 August, 1942, *Estado de São Paulo*, 18 July, 1942). The rubber area will also benefit eventually from the agreement of 4th September for the United States to assist in developing food production in northern and north-eastern Brazil, from Amazonas as far south as Bahia. This undertaking will include irrigation works, land drainage, and improvement of water storage and distribution. The United States will contribute $2,000,000 in the next two years, and Brazil between 30,000 and 35,000 contos (*Prensa*, 5, *Christian Science Monitor*, 9, *Jornal*, 10 September, 1942).

Colombia is reported to have agreed to sell all its rubber exports to the United States for the next five years, and is to receive credits of $1,000,000 for the development of the rubber industry. Dealings in crude rubber have been taken over by the Government and the collection of rubber is said to have increased. A rubber expert has estimated that Colombia could produce 2,000 tons in 1942 and 5,000 tons in 1943, of which a part, at least, would be available for export to the United States (*Christian Science Monitor*, 9 July, 1942). The Colombian Government was said to be working hard to secure speedy, well-organized, and well-protected exploitation of rubber (*Tiempo*, 15 April, 1942).

In July, 1942, Ecuador signed an agreement with the United States for the sale of all rubber produced, in excess of domestic needs, for five years. Several hundred tons, then in warehouses, were to be taken over (*New York Herald Tribune*, 22 July, 1942) and the price was fixed at 33 cents a pound, though it was hoped this might be raised. It was estimated that Ecuador could produce 6,000,000 lb. of crude rubber in 1942 (*Christian Science Monitor*, 25 March, 1942).

The Peruvian agreement signed with the United States in April, 1942, provided for the establishment of a Peruvian Amazon Corporation to develop production of wild rubber, among other tropical products. The Rubber Reserve Company agreed to make $1,125,000 available for increasing production of wild rubber and to take the entire output, except that needed for essential domestic use, over a period of five years.

In March, 1942, Mr. Sumner Welles was reported to have declared that conversations were in progress with Venezuela and other countries for the development of rubber production (*Heraldo*, 3 March, 1942). At the beginning of May *El Heraldo* (2 May, 1942) reported with gratification that the first delivery of rubber produced in the Amazonas Territory had reached Puerto Ayacucho. The new Government price of 2·55 bolívares† per kg. was said to have stimulated production, and Indian tribes in the jungles of Amazonia had begun extracting rubber again. It was estimated that the output from the Federal Territory would be over 420,000 lb. for 1942; while this will help to meet domestic requirements it is not thought to be enough to permit export. Construction of new roads and the introduction of new methods of collecting the wild rubber may, however, increase production greatly in 1943 (*Christian Science Monitor*, 3 June, 1942). A special Diesel-engined amphibian carrier boat, designed by a New Orleans firm of builders of torpedo boats and invasion barges, was believed to be a possible solution to the transport problem; this boat could bring impenetrable districts of the southern Venezuelan jungle within easy reach of civilization. It was claimed that one of these boats, carrying 100 tons of cargo, could make the trip from Puerto Ayacucho to Ciudad Bolívar in 24 hours, instead of in 10 days as at present.

Mexico and Central America.

At the end of July, 1942, an agreement was signed with the United States with the object of increasing rubber production in Mexico. A sum of $4,330,560 is to be invested over a period of eight years in the cultivation of Hevea trees on five demonstration plantations of 300 ha. each, where methods of production are to be tested and demonstrated to prospective growers. The United States is to furnish technicians and make a grant of $890,000. In the following six months 25,000 plants, grown on an experimental station in the State of Veracruz, were to be ready for distribution, and during 1943 a much larger quantity should be available. The aim is eventually to cultivate 5,000 ha., as it is considered that this would supply domestic requirements. At the same time the President issued an order to regularize, rationalize, and control the exploitation of rubber-producing species in the country (*Nacional*, *Christian Science Monitor*, 30 July, 1942). The signing of an agreement has been reported by which the United States will purchase from Mexico its entire surplus of Guayule until the end of 1946: any such surplus is to go to the United States, though if the output of crude rubber should fall below Mexico's needs, which are to be fixed by mutual agreement, the United States will supply the balance. The effect of the agreement will be to impose rubber restrictions on the Mexican public, but it also provides for the allocation of funds for the development of production. According to *Excelsior* (19 July, 1942) Guayule production was sufficient to solve almost entirely the problem of rubber supplies in Mexico, and the Mexican Department of Agriculture was quoted as saying that the potential capacity of production was 7,000 tons, whereas, in 1941, 6,000 tons of rubber had been extracted.

Guatemala has recently agreed to sell to the United States all rubber available for export up to the end of 1946. Government control of all dealings in rubber has been instituted in Guatemala, and regulations have been issued for the control of rubber production ((*Imparcial*, 7, 11 April, 1942). The United States has also agreed to purchase all rubber produced in Honduras up to the end of 1946. According to a report in the *Diario*, 1 April,

* Exchange approximately 1 contos = £10. † Exchange at par, 25·25 Bs. = £1.

1942, a board was being organized in Honduras to control the production and export of wild rubber. The United States is to buy all available crude rubber from Nicaragua until the end of 1946, and the Department of Agriculture is to assist in enlarging Nicaragua's agricultural production, particularly rubber (*New York Herald Tribune*, 26 April, 1942). Rubber cultivation was to be intensified in 1942, and an experimental farm was to be set up in Nicaragua to enable young Central Americans to study rubber cultivation under the direction of North American technicians (*Diario Latino*, 12 June, 1942). There are already various experimental stations functioning in Central America, notably in Costa Rica and Honduras, and the United Fruit Company's policy, mentioned above, may have important effects in Central America. In Panama, which previously exported small quantities of rubber, the industry has been paralysed in recent years, and it is suggested that wild-rubber production be encouraged by exchange with the United States of raw material for rubber tyres (*Panama American*, 5 April, 1942). The number of wild and semi-wild trees was estimated by the *Christian Science Monitor* (1 May, 1942) at between two and three million, but experiments by the Goodyear Company and other concerns with Far Eastern high-yield trees in Panama are said to have been unsuccessful, though in the past a considerable number of trees were planted. Panama is recently reported to have agreed to sell all rubber, not essential to domestic needs, to the United States until the end of 1946. No estimate of potential output is available, but in 1912 Panama exported 218,697 lb. (*Imparcial*, 12 May, 1942). It was reported that plantations of high-yield rubber trees were to be established in El Salvador and other Central American countries. There were also said to be neglected plantations in El Salvador (*Diario Latino*, 25 May, 9 February, 1942).

In Haiti rubber plantations are being developed under the direction of a United States–Haitian organization, and it is rumoured that steps will be taken to produce rubber in Cuba where it might possibly be produced without great difficulty if the United States were to guarantee a market after the war (*Nacional*, 1 April, 1942).

LIST OF THE NEWSPAPERS AND PERIODICALS CITED AND THEIR PLACE OF PUBLICATION.

Chicago Daily News, Chicago
Christian Science Monitor, Boston
Correio da Manhã, Rio de Janeiro
Diario, La Paz
Diario Latino, San Salvador
Estado de São Paulo, São Paulo
Excelsior, Mexico D.F.
Fortune, New York
Heraldo, Caracas
Imparcial, Guatemala
Jornal, Rio de Janeiro
Jornal do Commercio, Rio de Janeiro
Nación, Buenos Aires
Nacional, Mexico D.F.
New York Herald Tribune, New York
New York Times, New York
Noite, Rio de Janeiro
Panama American, Panama
Prensa, Buenos Aires
Razón, La Paz
Tiempo, Bogota
United States News, Washington
Universal, Mexico D.F.

COMMERCIAL POSSIBILITIES IN BRAZIL'S FOREST WEALTH*

By C. W. SLIFKO
U.S. Department of Commerce

BRAZIL, with its vast expanses of wooded territory, including the fabulous Amazon region, ranks second among the countries of the world in extent of forest area. Forests cover about 1,000,000,000 acres, or one-half of the total land area. The total forest acreage of Brazil constitutes nearly one-half of the entire stand on the South American continent; it is considerably larger than that of the United States, and is exceeded in size only by that of the U.S.S.R.

While the Amazon territory accounts for Brazil's leading position in the realm of forest resources, other States in the country also have abundant growth. The accompanying map shows in general the distribution of these forests. It can be seen that there are three rather well-defined forest belts, as follows:—(1) The southern; (2) the Atlantic coastal slope; and (3) the northern (including the States drained by the Amazon river and its tributaries).

VALUABLE 'SECONDARY' PRODUCTS.

The forest wealth of Brazil is being steadily developed. It provides most of the wood needed in the country for construction, railroad ties, and other purposes, as well as important secondary forest products such as wax, oils, rubber, nuts, tannin and fibres. In fact, the commodities which are extracted or derived from trees have greater commercial value than those mechanically converted, particularly in the States of Amazonas, Ceara, Piaui, and in the Acre Territory; both domestic and foreign markets are available for these commodities. Extensive domestic markets for lumber, which are necessary to sustain a large-scale logging and sawmill industry, have not as yet been developed, principally because of the greater use of other materials in housing construction. Wood, in its natural form or as charcoal, is, however, widely used as household and industrial fuel.

Up to the present time, the forests located in the south and in proximity to the populous areas of the coast have been utilized more fully than those in other areas; this is especially true with regard to lumber production. Though many of the original stands in these regions have been cleared as a result of urban and rural expansion, virgin growth is still found to a considerable extent, and as yet there has been no intensive utilization.

WAR ACCELERATES INDUSTRY.

Increased wood requirements during the first World War resulted in an expansion of Brazil's lumber industry. Since then the country has attained virtual self-sufficiency with respect to lumber and a quantity is produced for export, principally to the neighbouring River Plate markets. The present war has brought about a further increase in lumber exports. During the years 1939 to 1941, inclusive, the volume of lumber exported averaged about 250,000,000 bd. ft.; during the first ten months of 1942 there was an increase of 30 per cent. in volume of exports as compared with the same period of the previous year. In the years 1939 to 1941 the value of lumber exports constituted approximately 5 per cent. of the total value of all materials exported.

PARANA PINE CHIEF RESOURCE.

Parana Pine (*Araucaria brasiliana*) is the principal species for timber production, the wood being used chiefly for construction purposes. It occurs in extensive and relatively distinct stands and attains commercial timber size principally in the southern States of Parana and Santa Catarina, and to some extent in several adjoining States.

Railroad transportation links the Parana-Pine region with lumber markets, thus permitting lumber manufacture at the timber site. There are sawmills with modern equipment, and production is standardized. No statistics are available to show total production, but it is estimated that output in 1941 may have exceeded 500,000,000 bd. ft. Parana Pine was the principal item in lumber exports during 1941, accounting for about 85 per cent. of the total volume. Argentina was the principal market supplied while smaller amounts were shipped to Uruguay and Great Britain.

The establishment of a new pulp-manufacturing enterprise in this region is planned for the near future and Parana Pine will supply raw material for this important industry.

*Reproduced, slightly shortened, from *Foreign Commerce Weekly*, Washington, D.C., Volume 11, No. 1, April 3rd, 1943.

Mixed Growth in Atlantic Belt.

Significant expansion of lumber operations outside the Parana-Pine region has been limited by the character of the forests and by other factors, including lack of transportation, labour, and organization. Brazilian forests in the tropical or equatorial zone consist predominantly of deciduous or hardwood trees. Hardwoods find only limited outlets in the construction field, the principal market for lumber. Moreover, it appears that single species do not occur in very extensive stands, a condition which makes necessary high-cost, selective logging operations, and prevents the steady flow of a uniform raw material that is needed to maintain lumber operations and to supply market requirements efficiently.

Such conditions are to be found in the Atlantic slope forest, the main body of which is located in the State of Espirito Santo and in the adjoining parts of Minas Gerais and Bahia. Some authoritative surveys indicate that the forests in this area surpass those of other regions in density and size and in variety of commercially valuable trees. Lumbering in this region is an important activity, but is on a much smaller scale than in the Parana-Pine region. Construction lumber, cabinet woods, railroad ties, and other general utility woods from this source are supplied almost entirely to domestic markets; woods for the export trade consist of tropical woods of rare beauty and are much in demand, principally for furniture manufacture.

An integrated enterprise combining the manufacture of lumber and other valuable products would be an economical method of utilizing the forest wealth of this region. The availability of suitable raw material and the existence of markets for charcoal are circumstances that favour conversion through distillation. At the present time charcoal made by the simplest methods is being used extensively as industrial and domestic fuel; eventually outside markets for charcoal may develop.

Amazon's Lumber Resources.

The forests in northern Brazil range from the mouth of the Amazon to the headwaters of its numerous tributaries. Most of the region's inhabitants depend on the forests for their livelihood. Products typical of an equitorial climate, such as wax, oil seeds and nuts, edible nuts, cocoa, fibres, rubber and essential and medicinal oils, are valuable commodities in the region's export trade.

Utilization of the forests as a source of timber in this area is in its initial stage. Sawmills have been erected at several localities, but domestic lumber consumption has not reached sufficient proportions to justify the establishment of an extensive manufacturing industry. The largest domestic markets obtain lumber from more accessible areas and foreign markets take large quantities of timber in the unmanufactured state, including such woods as Mahogany, Cedar, and a few exotic cabinet woods.

Though many areas in this region have extensive forests, there is no information available as to the proportion of merchantable timber. The number of species in this region is estimated at more than 1,000, but only a few have been classified and tested as to properties, qualities, and possible uses. As in the Atlantic coastal slope, it has been found in the explored areas that distinct species occur within limited localities and that their density varies from acre to acre. Mixed hardwoods predominate, but there are also soft, pulpy woods. The hardwoods may be light, e.g. Balsa, 7 lb. per cu. ft., or extremely heavy (70 lb. per cu. ft.). Durable hardwoods of medium weight are acceptable for domestic construction.

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another or the same language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages.

The term "billion" used in papers originating in North America means a thousand million.

0. GENERAL FORESTRY

01. MATHEMATICAL AND STATISTICAL ANALYSIS

01.7. **The preparation of statistical tables.—A handbook.** U.S.D.A. Bureau of Agricultural Economics, Washington, D.C. (Revised ed.) 1942. pp. 39.

02. TEXTBOOKS. HANDBOOKS

02.1 : 9 : 11.4 : 12 : 61 : 4 : 60.3 : 2 : 8. EGGELING, W. J. **Elementary forestry: A first text book for African forest rangers.** Forest Department, Uganda. 1942. pp. 116 + plates.

This short text book, prepared by Dr. Eggeling with the collaboration of the senior staff of the Uganda Forest Department, is based on the course given in the Forest Rangers School, and is intended primarily for use in that school. In that the authors have provided a concise account of all that the probationer Forest Ranger should know in order to have a sound foundation on which to build with later experience, the book should be excellent for its purpose. For candidates for the Colonial Forest Service and for colonial foresters in general it should serve as a useful introduction to the forestry technique as adapted for tropical practice, since the standard silvicultural methods of Uganda which, with variations to suit local conditions, are widely used elsewhere, are described clearly and in detail.

There are nine sections in the text:—Forestry and Forest Policy, Soil, Simple Botany, Demarcation and Survey, Protection, Management and Exploitation, Silviculture, Administration, and finally a chapter of useful information which includes a glossary of vernacular names.

The chapter dealing with silviculture includes subsections on regeneration, nursery work and tending, and notes on the silviculture of some important species (*Chlorophora excelsa, Khaya* spp., *Entandrophragma* spp., *Eucalyptus robusta, E. saligna, Markhamia platycalyx* and *Acacia decurrens*). It is the part of most general interest, although those on demarcation, protection and administration should be of value to the Forest Officer going to the Colonies for the first time.

The chapter on soil gives a very simplified account of the origin of soils, their main characteristics in relation to plant growth and the factors determining type. There is also a note on how to describe soils. In such an undertaking there is always a danger of oversimplification which the authors have not been able to avoid entirely, especially in dealing with the deterioration of soil structure in relation to vegetation, although this may be due to the fact that 'cultivation' refers solely to native hoeing.

In Figure 1 the representation of the water table as horizontal is surely open to question; if its location is uncertain it might well be omitted. A. F.

05.3. *Annual Reports*

05.3 (54.2) : 97.1 : 23.24. UNITED PROVINCES. **Annual report of the Forest Development Division for the year 1940–41.** Forest Development Division, U.P. [1942?] pp. 8.

05.3 (54.87). CEYLON. **Administration report of the Conservator of Forests for 1941.** Ceylon Govt. Press, Colombo. 1942. pp. 7.

05.3 (66.9). NIGERIA. **Annual report on forest administration for the year 1941.** Forest Department, Ibadan. [1942?] pp. 19.

05.3 (71.1). BRITISH COLUMBIA. **Report of the Forest Branch for the year ended December 31st, 1942.** King's Printer, Victoria, B.C. 1943. pp. 69 + plates.

05.3 (71.21). MANITOBA. **Annual report of the Forest Service, fiscal year ending April 30th, 1942.** Department of Mines and Natural Resources, Manitoba. [1942?] pp. 31.

05.3 (71.21). SASKATCHEWAN. **Annual report of the Department of Natural Resources of the Province of Saskatchewan for the fiscal year ended April 30, 1942.** King's Printer, Regina. 1943. pp. 127.

05.3 (71.5). NEW BRUNSWICK. **106th annual report of the Department of Lands and Mines of the Province of New Brunswick for the year ended 31st October, 1942.** Fredericton, N.B. 1943. pp. 132 + plate.

05.3 (71.6). NOVA SCOTIA. **Report of the Department of Lands and Forests 1942.** King's Printer, Halifax, N.S. 1943. pp. 99 + plates + tables.

05.3 (729.7). TRINIDAD. **The Imperial College of Tropical Agriculture: report of the Governing Body and the Principal's report to December 31st, 1942.** St. Augustine, Trinidad. London Office: Grand Buildings, Trafalgar Square, W.C.2. 1943. pp. 23.

05.3 (74.6). CONNECTICUT. **Connecticut Agricultural Experiment Station, annual report for the year ending October 31, 1941.** *Bull. Conn. agric. Exp. Sta.* No. 452, 1942. pp. 35.

05.3 (78.1–3 : 78.7–8). UNITED STATES. **Seventh annual report of the Rocky Mountain Forest and Range Experiment Station, 1942.** Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colorado. [1943?] pp. 36 + iii + plates.

05.3 (945). VICTORIA. **Forests Commission of Victoria, Australia: Twenty-third annual report, financial year, 1941–42.** Govt. Printer, Melbourne. 1942. pp. 27.

06. SOCIETIES. ASSOCIATIONS. CONVENTIONS. CONFERENCES

06 (728 : 8). **Plant science institutions, stations, museums, gardens, societies and commissions in Central and South America.** *Chron. bot.* 7, 1942 (49–61). O.B.D.

06.2 (7 : 8) : 90 : 07.1–2 : 91.3 : 98.1. SCHMITZ, H. **The Second Inter-American Conference of Agriculture.** *J. For.* 41, 1943 (3–6). [University of Minnesota.]

The Second Inter-American Conference of Agriculture was held in Mexico City, D.F., July 6–16, 1942.

The work of the Conference was allocated to thirteen Sections, one of which (Section V) was devoted to forestry. The papers presented at this Section dealt with a variety of subjects which may be grouped under four main topics:—(1) The development of adequate forest policies; (2) the importance of developing forest resources; (3) the strengthening of forest education and research; (4) the influence of forests on the regulation of water resources. After the presentation and discussion of the papers, the following resolutions were prepared and approved:—Resolution No. 13 'Recommends: To the American Governments that they conduct as soon as possible an agricultural and forestal survey of each country, in order to determine the resources of cellulose, oil plants, waxes, gums, resins, tannins, colorants, fibers, woods, rubbers, insecticides, aromatic and medicinal plants, tars, etc., that are utilizable. The results of these surveys, together with studies of the present-day necessities and demands of the commerce of each country, shall be sent to the interested governments'.

Resolution No. 71 'Recommends: I. That the American countries develop a forest policy that will guarantee and stimulate the intelligent use of both public and private forest wealth. II. That they adopt measures to prevent forest destruction and the improper use of lands that because of their slope and special characteristics are more suitable for forest purposes. III. That the American Republics initiate and promote forestry research and the establishment of schools of forestry which will be adequate to meet requirements and to ensure the training of competent technical experts. IV. The establishment in the Continent of one or more centers in which students may acquire a good fundamental knowledge of forestry, as well as special courses in tropical forestry on a reasonably sound basis. V. That the American countries, individually and cooperatively, and within the limits of their economic, technical, and administrative possibilities, undertake surveys and economic and technical studies of their supply and demand for timber and other forest products, for the purpose of developing the processing industries to the best possible advantage. VI. That a Forestry Section be established in the Inter-American Institute of Agricultural Sciences which will facilitate the interchange of information and knowledge on forestry and will promote cooperation among the various technical services of the American nations. Pending establishment of this unit, it is recommended that such interchange be accomplished through the Tropical Forest Experiment Station at Rio Piedras, Puerto Rico. VII. That wherever needed, the countries of America promote the establishment of windbreaks and shelterbelts for the benefit of agricultural production. VIII. That special consideration be given to the advisability of creating exchanges or chambers of commerce dealing with forest products, under Government supervision, and working together for the greater success of the national or inter-American forest policy. IX. That the American countries, when considering the solution of their national fuel problems, encourage the substitution of oil, lignite, mineral coal, gas, et cetera, for vegetable fuels; and if the former are not readily obtainable, that the planting and maintenance of forest of rapidly growing trees be encouraged, as well as the improvement of existing forests by utilizing less valuable wood for fuel. X. That the countries of America give more attention to reducing exploitation of their forest production by prolonging the life of the wood through adequate preservative treatment. XI. That the Governments of the American countries compile statistics on forest fires and adopt whatever measures are considered necessary to protect their forest wealth against fire. XII. That the Governments of the American countries classify the forest lands that are suitable for grazing and that they adopt laws that will ensure the conservative use of such lands for that purpose'.

09.1. *Forest History*

09.1 (494). HENNE, A. Einfluss des Schweizerischen Forstvereins auf die Entwicklung des Forstwesens in der Schweiz 1843–1938. **[Influence of the Schweizerische Forstverein on the development of forestry in Switzerland 1843–1938.]** Buchdruckerei Büchler & Co., Bern. 1939. pp. 144. [G.]

09.2. *Pre-history*

09.2 (42.1–8). GODWIN, H. **A middle Bronze Age palstave from buried forest at Woodwalton Fen, Hunts.** *New Phytol.* 41, 1942 (165–70). [Botany School, Cambridge.] O.B.D.

During the operation of clearing prostrate trees from peat land a palstave of the middle Bronze Age type was excavated. Pollen analyses at the site served to strengthen the correlation between this archaeological period and the development on fenland margins of woods of Alder, Oak and Pine.

09.2 (481) : 31.0 : 12.25. ORDING, A. Skoghistoriske analyser fra Raknehaugen. **[Historical analysis of wood from Raknehaugen.]** *Medd. norske Skogforsøksv.* No. 27 [Vol. 8, No. 1], 1941 (90–130). [Nor.e.] N.D.A.

Raknehaugen in Romerike (Hedmark, Norway) is one of the most imposing monuments of the past in the north. The mound contains a considerable quantity of Scots Pine timber which has been analysed as to annual growth, tree taper, height, etc. From these data a description is given of the wood from which the timber was cut. The author suggests that it should be possible to date the wood fairly accurately from the material available. F. F.

09.2 (74 : 77) : 12.26–8. SEARS, P. B. **Postglacial migration of five forest genera.** *Amer. J. Bot.* 29, 1942 (684–91). [Oberlin College, Oberlin, Ohio.] O.B.D.

Pollen analyses of 117 bog profiles from 111 peat deposits within an area extending from Iowa to the Atlantic and from Tennessee to the St. Lawrence show that the general order of appearance of species in the northeastern part was apparently *Quercus, Tsuga, Fagus, Carya*, and *Tilia*, and in the southwestern part, *Quercus, Carya, Tilia, Tsuga*, and *Fagus*. Inferences are drawn concerning the possible relationship between changes in forest composition and climatic factors.

09.2 (77.4–5) : 12.19.2. POTZGER, J. E. **Pollen spectra from four bogs on the Gillen Nature Reserve along the Michigan-Wisconsin state line.** *Amer. Midl. Nat.* 28 (2), 1942 (501, 511). Biol. Abstr. 17 (4256). L.S.

The bogs are located in areas the forests of which are mainly of the northern hardwood type consisting primarily of *Acer saccharum, Betula lutea* and *Tsuga canadensis*. The specific aim of the study was to determine when the broadleaved forest invaded the region, how it was related to the Pine complex, and whether

Tsuga invaded as a component of the Pine or broadleaved associations. The four bogs show approximately the same forest succession, viz., *Picea* or *Picea/Pinus* to *Pinus* to *Betula/Tsuga/Pinus*. Marked replacement of *Pinus* by *Betula* and *Tsuga* took place when the upper ½ or ¼ of the sediments began to accumulate. *Acer saccharum* is sparsely represented in the pollen profiles but quadrat studies of the adjacent forests show that it equals *Tsuga* in density and importance in the crown cover. Insect-pollinated genera are not represented in the pollen profiles to an extent equivalent to their importance in the forest. *Tsuga* invaded jointly with broadleaved genera. Apparently the northern hardwood type is favoured climatically, and the microclimate ensures continued dominance by *Pinus* in forests on sandy habitats.

09.2 (77.5) : 12.26–8 : 12.19. WILSON, L. R., and WEBSTER, R. M. **Fossil evidence of wider post-pleistocene range for Butternut and Hickory in Wisconsin.** *Rhodora* 44, 1942 (409–14). [Coe College, Cedar Rapids, Iowa.] O.B.D.

Fossil pollen of Butternut (*Juglans cinerea*) and Hickory (? *Carya cordiformis*) was discovered in a peat bog in north central Wisconsin, about 50 miles east of the present range of Butternut and 90 miles north of the present range of Hickory.

09.2 (78.3) : 12.19. LEE, H. E. **The story of fossil wood.** *Mineralogist* (*Portland*) 9, 1941 (367). Biol. Abstr. 17 (6188).

A popular account of the occurrence and mode of formation of the petrified wood in South Dakota, with some comparisons between the ancient and present forest growth of that region.

09.2 (79.5). HANSEN, H. P. **A pollen study of a subalpine bog in the Blue Mountains of northeastern Oregon.** *Ecology* 24, 1943 (70–8). [Oregon State College, Corvallis.]

09.2 (79.5 : 79.7). DAKE, H. C. **Latah petrified forests.** *Mineralogist* (*Portland*) 10, 1942 (339–40, 352–3). Biol. Abstr. 17 (6176).

A non-technical description of some petrified wood deposits (mostly middle Miocene) in Washington and Oregon which were assumed to be of similar age to the Latah deposits. Indications are given as to the possible conditions under which the trees thrived and the relation of the logs to the associated ash and lava bed.

09.2 (79.5 : 79.7) : 12.19.1. HANSEN, H. P. **Post-pleistocene vegetation and climate of the Pacific northwest.** *Abstr.* in *Amer. J. Bot.* 29, 1942 (693–4). [Oregon State College, Corvallis, Oregon.] O.B.D.

A comparison is made, by means of pollen analyses of peat bogs and lake sediments, between the main tree species represented in the present climax forests and those of the pioneer post-glacial forests of the Puget lowland of Washington, the Oregon coast, northern Idaho and north central Washington.

09.4. *Forest Statistics*

09.4 (497.2). Bulgariens Forstwirtschaft. **[Bulgaria's forestry.]** *Holz* 5, 1942 (400). [G.] P.R.

According to information supplied by the Bulgarian Ministry of Agriculture the stocked and non-stocked forest areas at the beginning of 1942 were as follows:—

	Stocked areas		*Non-stocked areas*		*Total*
	ha.	*per cent.*	*ha.*	*per cent.*	*ha.*
Old Bulgaria	2,795,307	84	537,799	16	3,333,106
Southern Dobruja Regions acquired in 1941	98,291	88	12,978	12	111,269
	947,266	67	459,026	33	1,406,296
Total	3,840,864	79	1,009,803	21	4,850,671

The normal yield of the forests of Old Bulgaria is 6·82 million (solid) cu. m., of which 5·85 million cu. m. is hardwood and 0·97 million cu. m. coniferous timber. Owing to their poor condition, the forests in the regions gained in 1941 can yield at present only about 608,000 cu. m. per annum (555,000 cu. m. of hardwoods and 53,000 cu. m. of conifers). Those of Southern Dobruja consist almost entirely of coppice, with an annual yield of 98,000 cu. m. Thus the total normal yield of the country is 7·26 million cu. m., comprising 6·24 million cu. m. hardwoods and 1·02 million cu. m. conifers. However, owing to poor road systems and a lack of means of transport, complete utilization is not yet practicable. In Old Bulgaria the annual cut at present amounts to only 5·60 million cu. m., leaving 1·22 million cu. m. unutilized.

09.4 (87) : 12.19.1 : 94.1 : 34. GONZALEZ-VALE, M. Recursos forestales de Venezuela: descripción succinta; su valor económico presente y probable futuro; su conservación. **[Forest resources of Venezuela; brief description; their present and probable future economic value; their conservation.]** *Proc. eighth Amer. sci. Cong. 1940* 5, 1942 (79–93). [Span.] [Ministerio de Agricultura y Cría, Caracas, Venezuela.] A.P.B.

Notes on the forests and forest products of Venezuela. The total area of the forests, the majority of which are publicly owned, is estimated at 456,000 sq. km. or 50 per cent. of the land area.

09.7. *Monographs of Individual Forest Regions*

09.7 (54.8) : 12.19 : 2 : 12.26–8 : 33.0 : 32.21. KRISHNASWAMY, K. **The forests of Ramdurg State (Deccan).** *Indian For.* 69, 1943 (3–10).

Ramdurg occupies an area of 105,661 acres, of which 17,383 acres are covered by forests of the dry deciduous type in which xerophytic species predominate. The altitude of the country varies between 1,850 and 2,400 ft. The weather is very hot in summer and fairly cool in winter, and the rainfall is inadequate and unreliable. The bulk of the State is situated on the perennial river Malaprabha.

The forests, which contain some commercially valuable timber, are utilized locally for firewood, small timber, and grazing. Indigenous species used by the local population include *Wrightia tinctora*, which is used largely for toy manufacture, and *Chloroxylon swietenia*, a good constructional timber suitable also for bobbins. *Ailanthus excelsa* and *Salvadora persica* may prove suitable for matches, *Acacia arabica* for cartwheel manufacture, and *Grewia salvifolia* for walking sticks.

Among the commercially important species which may not be cut without licence are Sandal, Mango,

Melia azadirachta, Eugenia jambolana, Tamarindus indica, Pongamia glabra, and *Cassia auriculata.*

09.7 (64) : 12.19 : 12.26–8. BOULHOL, P. Le pays des gommiers du Sud-Marocain. **[The Gum-tree country of south Morocco.]** *Bull. Soc. Sci. nat. Maroc* No. 20, 1940 (60–95 + map). Biol. Abstr. 17 (4239).

A report on the phytogeography and ecology of *Acacia gummifera, A. farnesiana, A. albida, A. raddiana* (= *A. tortilis*) and *A. seyal.* The sylvan flora of the stations includes *Cupressus dupreziana, Argania spinosa, Rhus oxycantha, Tamarix aphylla, Eriophyes tlaïae, Maerua crassifolia, Balanites aegyptiaca* and *Calotropic procera.*

09.7 (71.4) : 12.19. TOUCHET, L. Description géographique et conditions forestières d'un secteur de la vallée de l'Outaouais. **[Geographical description of and forest conditions in a sector of the Outaouais valley.]** *La Forêt Québecoise* 5, 1943 (96–106). [F.]

09.7 (72) : 09.1 : 12.19.2 : 09.4 : 98.2 : 34.26. MEYER, H. A. **Forestry and forest resources in Mexico.** *Carib. For.* 4, 1942 (1–8). [E.e.span.] [Pennsylvania State College.]

Mexico's forest history is not unlike that of many other countries in which exploitation greatly reduced the forest resource before conservation measures were applied. However, toward the end of the nineteenth century, Ing. Miguel A. de Quevedo started a protection movement; a forest school and a large forest nursery were established near Mexico City, and in 1909 a Bureau of Forestry was set up within the Department of Agriculture; a forest law was enacted in 1926.

In Mexico there is a great variation in climate and soils resulting in a correspondingly wide variety of forest types. Tropical forests cover the coastal regions on the Gulf of Mexico and a narrow strip along the Pacific coast. Subtropical vegetation covers the foothills, and important coniferous forests cover the Sierras. The majority of the tree species have been identified but little is known concerning the character and extent of forest types. There are at present 28 million ha. of forested land and an additional 145 million ha. of non-productive forest land. Saw-timber exploitation is low, so that if properly managed the present forest area would ensure perpetual production at the required level. A secondary product of Mexico's forests is chicle, used in chewing-gum manufacture. Production is centred in Campeche and Quintana Roo, and exceeded 2,500,000 kg. in 1937. Recently a large number of parks and protection forests have been set aside. A flexible forest yield tax facilitates government control of forest exploitation, and forestry education and the formation of communal forests are being encouraged. *From author's summary.*

09.7 (728.2) : 12.19 : 98.2. LUNDELL, C. L. **The vegetation and natural resources of British Honduras.** *Chron. bot.* 7, 1942 (169–71). [University of Michigan Herbarium.] O.B.D.

The Pinelands and barrens of British Honduras, which occur on silicious sands and coarse grits, are characterized by *Pinus caribaea* and its associates *Byrsonima crassifolia, Curatella americana* and *Quercus* spp. The quasi-rain-forest area in the northern half of the colony has *Achras zapota* as the dominant tree, associated with species of *Brosimum, Swietenia, Cryosophila, Bursera, Protium, Matayba, Dipholis, Dialium, Metopium, Mosquitoxylum, Spondias, Calophyllum, Lucuma, Sideroxylon, Sabal, Coccoloba, Nectandra, Ocotea, Lonchocarpus, Zanthoxylum, Trichilia, Sebastiania, Ficus* and *Cordia.* This quasi-rain-forest represents advanced secondary growth. The true rain-forest of the southern area shows considerable diversity of species. The characteristic trees of the limestone areas are species of *Achras, Sabal, Dipholis, Drypetes, Ilex, Terminalia, Swietenia, Pseudolmedia, Sebastiania, Standleyana, Vitex, Sideroxylon, Trichilia, Cufodontia, Cymbopetalum, Protium, Calophyllum, Ficus, Bourerìa, Orbignya, Crysosophila* and *Brosimum.* The little-known rain-forests of the central metamorphic region are said to include species of *Terminalia, Calophyllum, Symphonia, Vochysia, Aspidosperma, Licania, Tetragastris, Podocarpus, Schizocardia, Ficus, Virola, Dialium,* and *Dalbergia.*

The Mahogany industry is still the economic mainstay of the country. Other woods, exported in small quantities, are Spanish Cedar (*Cedrela mexicana*), Banak (*Virola merendonis*), Santa Maria (*Calophyllum calaba*), and Yemeri (*Vochysia hondurensis*). The production of Pine lumber is sufficient to meet local demands, but with fire control an excess for export is possible. Secondary woods also offer possibilities. Chicle, the gum from *Achras zapota,* is already of economic importance.

09.7 (75 : 76) : 12.25. HINDE, J. P. **The primeval Pine country.** *Sth. Pulp Paper J.* 5 (5), 1942 (22–3, 25–6). *Abstr.* in *Bull. Inst. Paper Chem.* 13 (143). P.O.

A picture of the physical characteristics and the types of forest distribution on the coastal plain of the southern and southeastern United States in colonial times is given. The forests contained trees of many kinds, but Pines strongly predominated in most of the areas.

09.7 (82) : 21.23. AGUERRE, R. O. Forestales indígenas útiles de Santiago del Estero, sus características y formas de multiplicarlos. **[Useful indigenous forests of Santiago del Estero, their characteristics, and methods of reproduction.]** *Alm. Argentina Min. Agric.* No. 17, 1942 (371–8). [Span.] U.S.D.A. Bibliog. (Plant Science) 2 (D–28).

09.7 (86) : 91.7 : 12.26–8 : 12.19 : 34.25–6. MOLESTINA, O. E. Reseña agrícola del Ecuador. **[Agricultural review of Ecuador.]** *Chron. bot.* 7, 1942 (167–9). [Span.] [Dirección General de Agricultura, Quito, Ecuador.] O.B.D.

The forests of Ecuador contain many useful species, from the finest cabinet woods to less valuable timbers suited for ordinary industrial purposes. Balsa (*Ochroma* sp.) is the most important species for export. Trees of economic importance apart from their timber include *Cinchona* sp. and *Hevea brasiliensis.*

1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

11.4. *Soil*

11.4 : 21.3 : 24 : 23.26.4. WILDE, S. A. **Forest soils: origin, properties, relation to vegetation, and silvicultural management.** Kramer Business Service Inc., Madison, Wisconsin. (2nd edition, revised) 1942. pp. 319 + plates. [Wisconsin Conservation Department.]

This mimeographed publication gives a comprehensive treatment of the subject of forest soils and is

intended to meet the requirements of men engaged in forestry and related branches of land utilization. A brief historical review of the subject is given and the main text is divided into five parts as follows:—I. Genesis of forest soils. II. Soil as a medium for tree growth. III. Analysis of forest soils. IV. Forest soils in relation to silviculture and forest management. V. Management of forest nursery soils. A comprehensive list of references is given at the end of each of the 29 chapters.

11.43. Biology of Soil, including Mycorrhiza

11.43.1 : 01.6. KELLEY, A. P. **Additions to the literature of mycorrhizae.** *Suppl.* No. 6 to 'The Literature of Mycorrhizae'. Landenberg, Pennsylvania. 1943. pp. 7.

A current bibliography with abstracts. [Cf. *For. Abstr.* 2 (10), 3 (20), 4 (14).]

11.43.1 : 11.49.5 : 11.47.13. BJÖRKMAN, E. Mykorrhizans utbildning och frekvens hos skogsträd på askgödslade och ogödslade delar av dikad myr. [**The development and frequency of mycorrhizae on forest trees in ash-manured and unmanured areas of drained peat.**] *Medd. Skogsförsöksanst. Stockh.* 32, 1940–41 (255–96). [Sw.sw.g.] E.F.A.

The investigations described were carried out in 1939–40 in a peat area in Västerbotten that was drained in 1910. Two plots were manured with wood ash, one in 1918 at a rate of 3,300 kg. of ash per ha. and the other in 1926 at a rate of 12,500 kg. per ha. A satisfactory tree vegetation, comprising Pine, Spruce, and Birch, has developed on the manured plots only, and it is thought that its absence or scarcity in the remainder of the peat area can be ascribed to deficiencies in mineral nutrients. Mycorrhizae, although nowhere entirely absent, developed well only in the lightly manured plot. Their fairly weak development in the heavily manured plot is as yet unexplained.

11.43.1 : 12.21 : 12.25 : 12.26–8. LIHNELL, D. *Coenococcum graniforme* als Mycorrhizabildner von Waldbäumen. [***Coenococcum graniforme* as a mycorrhiza-producer on forest trees.**] *Symb. bot. upsaliens* 5 (2), 1942. pp. 19. R.A.M. 22 (104).

From four localities in Sweden and Denmark the writer collected the mycelium and sclerotia of *Coenococcum graniforme*. The four isolates, which are morphologically closely similar, readily formed anastomoses in pure culture, a fact interpreted as an indication of near relationship. By means of experiments the fungus was shown to be capable of forming on *Pinus sylvestris*, Spruce, Birch (*Betula verrucosa*), Aspen, and Lime (*Tilia cordata*) mycorrhiza of the so-called 'Dn' type, characterized by their black colour, profusely radiating, coarse, black hyphae, and reticulate mantle. Negative results were given by tests on Juniper, *Salix caprea* and *S. repens*, and Alder (*Alnus glutinosa*), but there is some evidence to suggest that mycorrhizal production by *C. graniforme* on these species is not excluded under conditions other than those selected for the trials.

The appearance and mode of growth of the mycelium of *C. graniforme*, its tendency to produce mycorrhiza on various kinds of forest trees, and the similarity of these formations to those of *M[ycelium] r[adicis] nigrostrigosum* are considered to leave no doubt as to the identity of the two fungi. A basis for the discussion of the taxonomic status of *C. graniforme* may be afforded by the structural analogies between the hyphal mantles of the mycorrhiza in this species and the perithecial walls of the genus *Cephalotheca* (Plectascales).

11.43.1 : 12.25. HOW, J. E. **The mycorrhizal relations of Larch. III. Mycorrhiza formation in nature.** *Ann. Bot., Lond.* 6 (21), 1942 (103–29 + plate). [Bedford College.] L.S.

In European Larch the majority of the mycorrhizae are normally formed by the infection of the shorter, sublateral roots. *Boletus elegans* and *Paxillus involutus* have been isolated from the mycorrhizae of Larch, and *Mycelium radicis atrovirens* from pseudo-mycorrhizae. Detailed descriptions are given of the structural features resulting from infection. Experiments on mycorrhiza-formation in culture are described in the appendix. Attempts to procure mycorrhizal associations in seedlings inoculated with *B. elegans* or *P. involutus* met with no success. [Cf. *For. Abstr.* 3 (103).]

11.43.1 : 12.25. KELLEY, A. P. **Note on the mycorrhizae of *Pinus virginiana* Mill.** Landenberg Laboratory, Landenberg, Pa. 1943. p. 1.

Results from the preliminary experiment described indicate that clay is unfavourable to the development of mycorrhizae.

11.43.1 : 21.3 : 12.25. ROBAK, H. Om skogtraernes mykorrhiza. [**Mycorrhiza on forest trees.**] *Tidsskr. Skogbr.* 50, 1942 (334–42). [Nor.] N.D.A.

A brief popular review of problems relating to mycorrhiza; a short description of the 'mineral', 'organic nitrogen' and 'physical' theories of mycorrhizal activity is included. The author agrees with Professor O. Hagem that 10- to 20-year stagnation of Spruce on raw humus is probably connected with mycorrhizal conditions in the soil. F. F.

11.43.1 (78.8) : 12.25 : 12.26–8. THOMAS, W. D. **Mycorhizae associated with some Colorado flora.** *Phytopathology* 33, 1943 (144–9). [Colorado State College.]

Ectotrophic mycorrhizae were found only on trees and shrubs, the coralloid type being most common. The ball type appeared only on members of the Betulaceae and on *Salix scouleriana*. Ectendotrophic forms were found on the roots of only six species: *Picea engelmanni*, *Prunus virginiana*, *Fraxinus pennsylvanica*, *Robinia pseudoacacia*, *Gleditsia triacanthos*, and *Cercocarpus montanus*. Among endotrophic mycorrhizae, the peloton and vesicular types were most common while the arbuscular type was somewhat rare. No true endotrophic mycorrhizae were found on trees or shrubs. Pseudomycorrhizae occurred mainly on the Pinaceae, but were also found on *Ulmus americana*, *Prunus americana*, *P. pennsylvanica*, *Acer glabrum* and *Gleditsia triacanthos*.

11.43.1 : 12.26–8. KELLEY, A. P. **The process of phagocytosis in mycorrhizae: with especial reference to a phenological study of mycorrhizal phagocytosis in *Fraxinus americana*.** Landenberg Laboratory, Landenberg, Pa. 1943. pp. 16.

The term 'phagocytosis' is taken to mean the digestion within a cell of some material foreign to its substance, and is applied particularly to the digestion of fungal material by a non-fungal plant cell. This process of digestion is essentially similar in all cases. The thin-walled, plasma-rich hyphae penetrate into the cortical (or epidermal) cells, rupture either at once or

after having formed skeins or much-branched structures, and disgorge their plasma content into the cortical cell where it is digested. The ruptured hyphal walls, however, usually remain embedded, undigested, in the cytoplasm of the 'host' cell.

The literature on mycorrhizal phagocytosis is collected and reviewed under five headings:—(1) phagocytosis in liverworts, (2) digestion in mosses, (3) digestion in Pteridophytes, (4) phagocytosis in Gymnosperms, and (5) phagocytosis in Angiosperms. A special study was made of mycorrhizal phagocytosis in a mature tree of American White Ash (*Fraxinus americana* L.). In March, when the tree was still apparently in a winter condition, the mycorrhizal cortical cells contained large oily-looking droplets existing freely in the cell lumen. These took on a deep red stain with safranin. About the middle of April, coincident with increasing vegetative activity, the droplets began to degenerate and to decrease in size. In May the droplets became still more finely divided and began to lose their red-staining capacity. In the latter part of the month they had almost entirely disappeared, but instead there appeared flocculent masses of blue-staining material in the cells, and enlarged nuclei. The successive stages seem to indicate that the stored fungal material was being used by a phagocytotic process in the development of new tissues for the 'host' plant.

One significant fact concerning mycorrhizae is that the locus of phagocytotic activity is confined to a certain region in a given species of 'host' plant. It is suggested that this phenomenon may be the result of a certain ionic concentration existing in the phagocytotic cells, the hypha being able to grow without hindrance until it reaches a particular region in the cortex where increasing ionic concentrations cause its death.

11.47. Maintenance of Favourable Soil Conditions

11.47 : 12.25 (43.1–5) : 21.3 : 34.21 : 46. WIEDEMANN, E. Die schlechtesten ostdeutschen Kiefernbestände. Die Ursachen ihres Zustandes und Wege zu ihrer Besserung. **[The poorest Pine stands of eastern Germany. The causes of their condition and ways of improving them.]** Reichsnährstand Verlags-Ges. m.b.H., Berlin. 1942. pp. 196. [G.] [Preussische Versuchsanstalt für Waldwirtschaft.] *Abstr.* in *Forschungsdienst* 14, 1942 (11). [G.] A.P.B.

There are some 500,000 ha. of Pine stands in eastern Germany that show poor growth due to unfavourable site conditions and to the continuous removal of litter over long periods in the past. Litter removal is the main cause of the unsatisfactory state of these stands: it decreases considerably the soil content of readily soluble nutrients, causes deterioration of the ground flora and so injures the water economy that in dry summers the Pines suffer from draught as early in the year as May. Root studies indicated a distinct lack of fine roots. Improvement demands in the first place the discontinuance of litter utilization. Among cultivation methods, moor culture and complete ploughing have proved effective. Stump-grubbing should not be undertaken. Potassium-magnesium and kainite are effective fertilisers, but it is preferable to increase the humus content of the soil by adding to it cereal waste, peat, or litter. Where an admixture of broadleaved trees is practicable, Red Oak, Oak, Poplar, Grey Alder and Birch are useful. Their roots are more effective than those of Pine in penetrating the deeper soil layers.

11.47.1 : 12.26–8 : 24 : 34.26. KIMBROUGH, W. D., MILLER, J. C., and WILSON, W. F. **Fertilizer results with Tung trees and recommended cultural methods.** *Bull. La. agric. Exp. Sta.* No. 352, 1942. pp. 16. E.S.R. 88 (341).

11.47.1 : 23.26.4 : 12.25. CONNECTICUT. **Connecticut Agricultural Experiment Station. Annual report for the year ending October 31, 1941.** *Bull. Conn. agric. Exp. Sta.* No. 452, 1942. pp. 35.

Seedbed experiments showed that liquid fertilizers high in phosphorus were more effective than other mixtures in increasing the growth of nursery stock, while nitrogenous fertilizers or mixtures high in nitrogen were generally ineffective and sometimes injurious. A top dressing of superphosphate and muriate of potash in dry form on 2–0 stock was somewhat beneficial to Norway Spruce but not to White Pine (p. 25).

11.47.13 : 23.26.4 : 12.25. NĚMEC, A. **The effect of unbalanced fertilization with potash salt and kainite on the nutrition of the Pine in forest nurseries. III. The effect of fertilization on the absorption of manganese, iron, aluminium and silica.** *Sbornik Ceskoslov. Akad. Zemědělské* 15, 1940 (86–94). *Chem. Zentr.* I, 1941 (1085). Chem. Abstr. 37 (1002). P.R.

Unbalanced fertilization with 40 per cent. potash salt or with kainite markedly increases the Mn absorption of the needles on soils that are acid due to ion exchange, more so on soils poor in than on those rich in K_2O. The Fe absorption is also increased, likewise that of Al; in the latter case the 40 per cent. potash salt has a stronger effect than kainite, especially on soils rich in Al. On soils high in SiO_2 and poor in K_2O, one-sided fertilization with K_2O considerably increases the SiO_2 absorption in the needles, but on soils rich in K_2O the SiO_2 content is generally not affected. On soils poor in SiO_2, the SiO_2 absorption is slightly increased by one-sided fertilization with K_2O only when they contain less than 130 mg. of citric acid-soluble K_2O per kg.

11.49. Soil Types

11.49.5 (485) : 38.62 : 21.3. MALMSTRÖM, C. Korta anvisningar för bedömning av torvmarkers lämplighet för skogsdikning. **[Brief directions for judging of the suitability of peat soils for drainage for forest production.]** *Skogliga Rön* No. 6 (2nd edition) [1940?]. pp. 17. [Sw.] E.F.A.

Some peat soils improve rapidly after drainage and may become highly productive, others show no, or only very slight, improvement even though they have been well drained for a number of years. Between these two extremes are to be found peat soils varying greatly as to their suitability for forest production. Indications as to suitability for drainage and the growing of forest may be obtained from the type of vegetation present. In many cases it is also necessary to take into account certain other factors, in particular the climatic position of the soil, nutritive conditions and possibilities of drainage.

The pamphlet includes a map which is based on experience up to the present of the reaction of peat soils to drainage, and shows from this viewpoint the possibilities in Sweden of draining such land for the growth of forest.

11.49.6 : 11.41.7 : 11.42.1 : 21.3 : 12.26–8. **Forest soils.** *Indian For.* 68, 1942 (548–9).

Investigations showed that clay recovery from lateritic soils increased with fineness of grinding, the percentage increase from coarsest (2 mm.) to finest (0·05 mm.) grade, calculated on the basis of the non-clay fraction, giving some indication of the deterioration of the soil for Teak. In the natural forest, soils without Teak were found to be more clayey than those with Teak. Moreover, the ratio of free SiO_2/combined SiO_2 for soil bearing Teak was more than 10 times that for soils without Teak. In the clay fraction of these soils the amount of free SiO_2 was practically nil. The formation and accumulation of clay, the removal of free silica and the accumulation of combined silica, therefore, seem to render soil unsuitable for the growth of Teak.

11.6. *Hydrographical Conditions. Water and Soil Conservation*

11.62 : 11.14.3–4 : 91.3 : 12.25 : 12.26–8. UNITED STATES. **Seventh annual report of the Rocky Mountain Forest and Range Experiment Station, 1942.** Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colorado. [1943?] pp. 36 + iii + plates.

From preliminary observations it appears that Aspen is at least as good as young Lodgepole Pine in establishing favourable watershed conditions. Measurements showed snow storage to be greater under Aspen (8·8 in.) than in open fields (7·61 in.) or under dense young Pine (6·72 in.), and interception of summer rainfall was found to be almost identical under Aspen and young Pine. In addition the soil profile under Aspen appears to be more permeable than that under Pine and is quite stable in relation to erosion (p. 24).

11.62 (54.2) : 23.1 : 12.26–8. **Notes relating to contour trenching in the Bamiaburu and Roro areas.** *Indian For.* 69, 1943 (11–4). [Forest Research Office, Bihar.]

Elucidation of some points raised in an article on contour trenching appearing in *Indian For.* 68 (301–2).

11.62.1 : 01.3. CROFT, A. R., WOODWARD, L., and ANDERSON, D. A. **Measurement of accelerated erosion on range-watershed land.** *J. For.* 41, 1943 (112–6). [Intermountain Forest and Range Exp. Sta.]

Accelerated erosion is an important factor in watershed management in the Great Basin. The present study, undertaken to obtain information on mountain soils in relation to forage, timber, wildlife and streamflow, was made on three adjacent watersheds on the west face of the Wasatch Mountains (Utah). It shows that soils can be classified in the field with a high degree of consistency into three groups representing normal (geological) erosion and moderate and severe deviations therefrom, and indicates the effect of varying degrees of erosion on organic matter, total nitrogen, and moisture equivalent. Accelerated erosion is most pronounced on areas that have been heavily grazed and is much more severe on south-facing than on north-facing slopes.

11.62.1 (54.5) : 97.1. GLOVER, H. M. **Erosion in the cultivated uplands of the North Punjab and its cure.** Superintendent, Govt. Printing, Lahore. 1941. pp. 3 + plates.

This pamphlet includes a series of photographs showing the effect of proper terracing and embankment of fields in contrast with conditions of erosion and gully formation on neglected land. Land improvement work by villagers is being organized by Co-operative Land Reclamation Societies under the direction of the Forest Department.

11.62.1 (54.5) : 97.3 : 45.11. GLOVER, H. M. **The Hoshiarpur Chos: their cause and cure.** Superintendent, Govt. Printing, Lahore. 1942. pp. 12 + plates.

In the Siwalik Hills of the Hoshiarpur District the cutting of the forests for fuelwood and uncontrolled grazing and browsing by cattle and goats has resulted in serious flooding, erosion of the top soil and destruction of cultivated fields. The Soil Conservation Circle of the Forest Department has closed forest areas to grazing in order to restore the natural vegetation. In this pamphlet a series of photographs shows the contrast in conditions between the closed and open areas.

11.62.11 (54). PRASAD, J. **Notes on some aspects of erosion control.** *Indian For. Leafl.* (*Silviculture*) No. 27, 1942. pp. 17. [Forest Research Institute, Dehra Dun.]

This leaflet discusses briefly information available from the literature on certain aspects of erosion control, including:—grazing control, improvement of grasslands, costs and effects of contour trenching and gully plugging, suitable materials for check dams and gully plugging, and maximum gradient to which cultivation is advisable.

11.62.11 (729.5) : 97.2. NOLLA, J. A. B. **Soil conservation in Puerto Rico and its influence upon the agricultural economy of the island.** *Proc. eighth Amer. sci. Congr. 1940* 5, 1942 (303–29). [University of Puerto Rico, Rio Piedras.] A.P.B.

11.62.11 : 23.24. **Are you growing gullies or trees?** *Bull. Ga. agric. Ext. Serv.* No. 487, 1941. pp. 14.

Simple instructions are given for the control of gully erosion on small drainage areas less than 10 acres in extent. After temporary control measures have been taken, the planting of young trees of Pine or Black Locust will ensure continued protection. The instructions are well illustrated with photographs.

12.1. *General Botany*

12.11. Physiology. Reproduction. Growth

12.11 : 12.14. DIXON, H. H. **Practical plant biology: a course of elementary lectures on the general morphology and physiology of plants.** Hodges, Figgis & Co., 20, Nassau St., Dublin. (2nd edition) 1943. pp. xii + 337.

12.11.1. *Metabolism. Plant Constituents. Sap Flow. Growth Substances. Reserve Materials*

12.11.12. CARROLL, G. H. **The rôle of ascorbic acid in plant nutrition.** *Bot. Rev.* 9, 1943 (41–8).

12.11.13 : 12.14.7 : 12.26–8. GIRTON, R. E., and PARK, E. R. **Respiration studies on germinating White-Oak acorns.** *Proc. Indiana Acad. Sci. 1941* 51, 1942 (83–6). [Purdue University.] A.P.B.

From these studies it is concluded that the high moisture content, usually 35 to 45 per cent., of the dormant acorns, is related to a high respiratory activity while still in a dormant condition, and that increased growth of the primary root in germination is accompanied by greater absorption of oxygen over a considerable period.

12.11.15 : 12.11.21–2 : 12.25. ZACH, L. W., BAUER, D., and GOODYEAR, H. **Practical application of plant hormones in forest-tree propagation.** *J. For.* 41, 1943 (214). [Oregon State College.]

Results from preliminary experiments show that:—(*a*) for extensive field planting, cuttings treated with indolebutyric acid are not practicable in the propagating of Douglas Fir, Port Orford Cedar, Western White Pine, Western Weeping Hemlock, Red Alder and Shipmast Locust; (*b*) seedlings (2–0 and 1–0 stock) of Douglas Fir, Port Orford Cedar and Ponderosa Pine, and of Western White Pine (2–0 stock only) do not react significantly to treatment with indolebutyric acid; (*c*) seeds of Sugar Pine and Port Orford Cedar treated with indolebutyric acid appear to give positive results, those of Western White Pine negative results, while those of Douglas Fir show no significant effect. It is suggested that the apparent ineffectiveness of hormone treatment may be due to temperature conditions.

12.11.16 : 12.25 : 23.23.11. BRITISH COLUMBIA. **Report of the Forest Branch for the year ended December 31st, 1942.** King's Printer, Victoria, B.C. 1943. pp. 69 + plates.

From work on the physiology of seed production by Douglas Fir, it appears that the fruiting status of the tree does not depend on the level of food reserves, but is related to fluctuations in the occurrence of individual reserve foods (pp. 16–7).

12.11.2. *Propagation. Growth. Development*

12.11.2 : 12.14.7. SALISBURY, E. J. **The reproductive capacity of plants: studies in quantitative biology.** G. Bell & Sons, Ltd., London. 1942. pp. xi + 244 + plates. [University of London.]

12.11.21 : 23.23.15. AFANASIEV, M. **Propagation of trees and shrubs by seed.** *Circ. Okla. agric. Exp. Sta.* No. C–106 [1942]. pp. 43. L.S.

Methods are described for the treatment of seed of which the germination is delayed owing to dormancy of the embryo or to impermeability of the seed coat to water. This is followed by practical advice on the procedure to be followed in order to obtain optimum results in the propagation by seed of more than fifty named species of trees and shrubs. Selected references are given for each species and a general bibliography is appended.

12.11.22 : 12.25 : 12.11.15. MCCULLOCH, W. F. **Field survival of vegetatively propagated Douglas Fir.** *J. For.* 41, 1943 (211–2). [Oregon State Board of Forestry.]

For the material and treatments used, the best results, as regards initial root development, were obtained from 1-year-old cuttings treated with indolebutyric acid at the rate of 8 mg./l. for 24 hours. Successful cuttings have been in the field for three growing seasons and have failed to develop a well-defined leader, growth being concentrated in the laterals. This may result in the development of a weeping variety of tree.

12.11.22 : 12.25. SHERRY, S. P. **A note on the vegetative propagation of *Pinus insignis*.** *J. S. Afr. For. Ass.* No. 9, 1942 (23–5 + plate).

Branch cuttings of *Pinus insignis* (*P. radiata*) were successfully rooted in nursery beds without the use of phytohormones. Cuttings from 2-year-old trees gave the best results in the nursery, both as regards height growth and survival, but in subsequent field trials cuttings from the first order branches of trees up to 8 years old proved as hardy as seedling transplants. All cuttings used were 7 in. long and it was found that their large size was a handicap in subsequent planting operations. It is suggested that future research should be directed towards producing smaller plants with vigorous root systems.

12.11.22 : 12.26–8 : 12.11.15. MEURMAN, O., and POHJANHEIMO, O. Kokeita koiviyen lisäämisestä pistokasversoista. **[Experiments in propagating Birch from cuttings.** Metsätalondellinen Aikakanslehti No. 9. Helsinki 1940. *Nord. JordbrForskn.* 23, 1941 (63–4). A.P.B.

An account is given of preliminary experiments carried out at the State Horticultural Research Institute at Piikiö to determine the possibilities for the vegetative propagation of Birch. Cuttings were treated with growth substances.

The best result was obtained in a small experiment with *Betula verrucosa* cuttings that had been taken from vigorously growing stump shoots. This experiment showed that 92 per cent. of the cuttings had formed roots. The cuttings had been treated with Belvitan solution (dose II) for 24 hours. In a larger experiment using 1-year green cuttings taken from curly Birch (masurbjörk), 74 per cent. developed roots with the same method of treatment. In the course of these experiments it appeared that, in addition to the treatment with suitable growth substances, root formation depended in a high degree on the type of cutting, the temperature and the soil mixture in the propagating frame. The cuttings of *B. pubescens* in general form roots more readily than those of *B. verrucosa*. The best cuttings are those from young, strongly developed, green shoots; ligneous cuttings give very poor results.

The propagation of the Birch by cuttings is of practical importance where such valuable types as curly Birch and wavy Birch (flammigbjörk) are concerned. These types do not reproduce true to type by seed, but exhibit a greater or less splitting up into different forms depending on the heterozygous constitution.

12.11.22 : 21.2 : 07.7. STOUTEMYER, V. T., and O'ROURKE, F. L. **Spray humidification and the rooting of greenwood cuttings.** *Amer. Nurseryman* 77 (1), 1943 (5–6, 24–5).

A device which has proved satisfactory in mechanical spray humidification of propagating greenhouses is a centrifugal atomizer such as is commonly used in textile mills. Rooting mediums and the time of taking the cuttings remain, however, important factors in the successful development of difficult plants. The best rooting medium in most cases was a mixture of approximately equal parts of sand and mikolite (vermiculite), a mica-bearing mineral expanded by heat. Infestation by insects occurred in only a few cases, and attack by cutting bench fungi was rare. The humidifying device is ideal for cuttings with large, drooping leaves. It allows cuttings to be taken early in the season at a stage most favourable for rooting.

12.11.23 : 12.14.4 : 12.25. FRIESNER, R. C. **Elongation of the primary axis in four species of Pines.** *Abstr.* in *Proc. Indiana Acad. Sci. 1941* 51, 1942 (73). [Butler University.] A.P.B.

Measurements of terminal internodes in 50 specimens each of *Pinus strobus*, *P. banksiana*, *P. sylvestris*, and *P. resinosa* were made weekly during the period April 1st to September 25th, 1941. *P. banksiana* and *P. sylvestris* reached their peak growth early in May, *P. strobus* and *P. resinosa* showing maximum growth somewhat later in the month. In all species elongation

came to a standstill, or nearly so, some time in June or July (for the majority of individuals during the week ending June 16th); but after a brief period of inactivity elongations of from 1 to 8 mm. weekly were noted for individuals of all species until September 25th.

12.11.23 : 12.14.5 : 12.26–8 : 21.11. GOUTHERET, R. Recherches sur le bourgeonnement du tissu cambial d'*Ulmus campestris*, cultivé en vitro. **[Investigations on bud formation by the cambial tissue of *Ulmus campestris* grown in vitro.]** *C.R. Acad. Sci. Paris* No. 210, 1940 (632–4). [F.] Biol. Abstr. 17 (6957).

When pieces of cambial tissue of the Elm are grown in vitro, the presence of a sugar determines the formation of buds, but buds do not develop into shoots except in the presence of light. The threshold of action of radiation is between $0{\cdot}66 \times 10^{-3}$ calories per min. per sq. cm. and $1{\cdot}32 \times 10^{-3}$ calories per min. per sq. cm. The most active radiations are those that are best absorbed by chlorophyll. Mannose is toxic and mannitol inhibits growth entirely.

12.11.23 : 12.25. STOCKWELL, P. ***Pinus* embryo size compared with growth rate.** *Amer. Nat.* 76, 1942 (431–2). [California Forest and Range Exp. Sta.] O.R.S.

In tests made with seed of *Pinus jeffreyi* and *P. lambertiana* no significant correlation was found between size of embryo (total length, length excluding cotyledons, width at point of cotyledon attachment and width of hypocotyl) and the size (height and diameter) of seedlings grown from them.

12.11.3. *Heredity. Breeding. Hybridization. Races and Questions of Provenance*

12.11.3 (485). SYLVÉN, N. Växtförädling av skogsträd. **[Forest tree breeding.]** In 'Tillvaratagande och förädling av mendervärdigt virke samt avfalls- och biprodukter i skogsindustrien'. Industriens Utredningsinstitut Norrlandsutredningen, Stockholm. 1942 (269–78). [Nor.] N.D.A.

[Cf. *For. Abstr.* 5 (58).]

The early history of forest-tree breeding in Sweden is outlined and the objects of the Forest Tree Breeding Association, which was founded in 1936, are defined. The first sub-station was opened in 1938 at Dalfors in Dalarna; three further sub-stations were opened in 1939 for the purpose of carrying out local tests and breeding work. The results obtained have been regularly published in the *Svensk Papperstidning*.

Improvement in quality is regarded as being quite as important as quantity, or even more important; stronger and more rapid growth and the resulting reduction in the growth cycle are specially stressed. The requirements of the main timber industries and of other buyers must also be considered in improving quality.

The methods adopted are direct selection (supplemented by individual progeny tests), hybridization, 'transgression breeding', and chromosome alterations, all of which have already been tested with agricultural plants.

Since natural populations of the main Swedish forest trees are still in existence the task of the breeder is simply to continue the work of selection that has been achieved by nature.

One essential for successful breeding is a thorough knowledge of all the different forms and varieties. A thorough investigation of the main Swedish forest trees from this standpoint was the first step undertaken by the new Association, and an appeal was made to all Swedish foresters to furnish information about stands or individual trees of good type, or off-type trees likely to be of value in breeding for particular objects.

As regards Pines, the narrow crowned, fine-branched types are more valuable than the broad-crowned type with coarse branches, and a special study has been made of the occurrence of the narrow-crowned Pines in five different localities. Cones have been collected from a number of narrow-crowned stands of the best type, to be used for progeny tests.

In Spruces, the 'comb' type with small pendulous branches is the most vigorous in Sweden and also the most resistant to disease. Special attention has therefore been paid to this type. Large-scale cellulose analyses of trees with different types of branching have already begun to show results in favour of the comb type; 50- to 70-year-old stands containing the maximum number of the comb type were selected, the trees being of the same age and spaced uniformly so that strict comparisons of growth increments in the different branching types were permissible. In the best stand in which comb Spruce predominated the average diameter for comb Spruces was 29·4 cm., as against 23·9 for the others, and the average height 26·6 m. as compared with 23·5—these are by no means maximum values. The other features of the comb Spruce show it to be a type of particular value for breeding purposes.

Among the hardwoods the Birch is becoming more and more important. By means of layering and budding it is possible to propagate from the best trees with curly-grained wood and use them as the starting-point for further multiplication.

Investigations on hardiness have been carried out with Spruce, Oak, Beech, Ash and Aspen. The Central European or 'German' Spruce, though it is more productive than the Swedish Spruces in central and southern Sweden, is deficient in hardiness. Hardier types have been selected during recent severe winters and these, when tested by artificial-freezing experiments, should prove of great practical value.

In Oak, Beech and Ash the forms that shed their leaves earlier in autumn have shown themselves to be hardier than those that remain green longest.

Two distinct types of Aspen have been found to exist, a northern long-day type, and a southern short-day type—the former being unsuitable for southern conditions, where growth is poor, and the latter being insufficiently winter-hardy for the north, where, however, it grows much taller. It is hoped that, by selection of the best northern Swedish Aspens with less pronounced long-day tendency or neutral photoperiodism and of hardier forms of vigorous southern Swedish Aspens, types may be produced that will be more suitable for all parts of the country.

Populations of forest trees have been shown to be genetically mixed as regards resistance to disease. The Association for Forest Tree Breeding began in its very first year a search for disease resistant Spruces and at Ekebo the progenies of a number of healthy trees found in an otherwise badly infected stand are under observation: the four-year-old trees are now to be subjected to artificial infection for selection of the resistant individuals. Other sound trees amongst infected stands have been marked and they are to be used for seed.

The value of artificial crossing and incidentally of the bottle-grafting method has been demonstrated in the results obtained from crosses between various Birch types and also different species of Alder, Larch, and other foreign conifers. It is now possible to have mass produced seed of Birch of pure curly Birch type. Bottle grafting has also been used with success for Spruce, Pine and Aspen.

As an example of the success of 'transgression breeding' hybrids of Aspen and Poplars are cited which exceed both parents in growth rate. The 57-chromosome giant Aspens are also cited as an instance of the superiority of polyploids as regards timber yield. By crossing the 57-chromosome giant Aspen with the ordinary Aspen, Nilsson-Ehle has produced an Aspen with 76-chromosomes which is a still more vigorous grower. Since the discovery of a female giant Aspen in 1937, crosses have been made between giant Aspens of different sexes and a large number of 76-chromosome Aspens, all equal to the first one in growth vigour, have now been produced. Colchicine treatment has been applied to numerous tree species and results of permanent practical value are already foreseen.

In addition to colchicine treatment, various other new techniques and modern adjuncts to the plant breeder's art can also be used in the improvement of forest trees (e.g. artificial illumination and freezing, strangulation to induce early flowering, new methods of grafting) to accelerate the breeding process in spite of the long reproductive cycle. These various methods must always utilize the existing diversity of forest trees and races adapted by nature to local conditions. The best use of these can be made only if the breeder works with the largest possible assortment. The Association is fortunate in having at Ekebo very adequate accommodation and modern equipment, details of which are given.

Analyses of the annual ring breadth, the autumn wood percentage, the volume weight and the content of resin, lignin and cellulose have been made from borer samples from 149 different 70-year-old Central European Spruces in Scania. The Spruces of different branching types gave similar values; but the breadth of the annual rings was demonstrably greater in the comb Spruce than in the brush Spruce or the 'plane' Spruce [plangran].* The analyses showed the existence of large individual differences which might well be of importance in breeding for quality; thus within the comb Spruces the resin content varied from 0·74 to 2·14 per cent. on a dry matter basis, the lignin content from 26·3 to 29·9 per cent., and the cellulose from 49·3 to 54·8 per cent. The corresponding figures for the brush Spruce were for resin content 0·58 to 1·25 per cent., lignin 27·9 to 29·6 per cent., and cellulose 50·0 to 54·6 per cent., while for the 'plangran' the values were resin 0·64 to 2·73 per cent., lignin 27·5 to 28·8 per cent. and cellulose 48·2 to 52·4 per cent. It would appear that the extreme differences represent genetically distinct types and indicate the possibility of producing desirable plus or minus variants for special industrial purposes.

In order to meet the needs of the timber industry, intimate co-operation between the breeders and the technical and industrial experts is obviously essential.

M. L. C. W.

12.11.3 : 12.11.23 : 12.25. ORDING, A. Vekstforedling av skogstraer. [**Tree breeding.**] *Tidsskr. Skogbr.* 51, 1943. [Nor.]

The author gives a popular account of tree breeding and indicates its possibilities in an intensive forestry programme. Mention is made of polyploidy in relation to increased growth and examples are given to show how rate of growth will vary with different varieties of the same species. Reference is made to growth measurements of 'comb Spruce' (kamgran) in Sweden which is shown to have 25 per cent. greater diameter growth and 13 per cent. greater height growth than other Spruce types in the same stand. F. F.

12.11.3 : 12.25 : 12.26–8. CUÉNOT, L. La transmission héréditaire dans les croisements entre espèces. [**Hereditary transmission in crosses between species.**] *Rev. sci., Paris* 79 (5/6), 1941 (317–9). [F.] Biol. Abstr. 17 (208).

Includes observations on *Abies*, *Quercus*, *Salix*, *Betula* and *Platanus*.

12.11.3 : 12.25. GOPAL-AYENGAR, A. R. **Structure and behaviour of meiotic chromosomes in Gymnosperms.** *Abstr.* in *Genetics* 27 (1), 1942 (143). [University of Toronto.] L.S.

By a technique which involves pre-treatment of the material before fixation with $NaCN_3$ $^{-5}$ Mol. for 45 seconds to one minute and subsequent staining by the use of the Feulgen nucleal reaction or with aceto-carmine, it has been possible to unravel the coiling systems of the meiotic chromosomes in species of *Pinus*, *Taxus* and *Ginkgo*. The number of gyres of the major spirals of particular chromosomes can be determined with certainty and is variable among and between bivalents. Generally speaking, there is a direct relation between chromosome length and the number of gyres. Reversals of coiling occur on either side of the centromere. There is undoubted evidence of a minor coil in the I metaphase and anaphase chromosomes of all the species investigated. The chiasma frequency of *Ginkgo* is between 1·8–2·5. Meiotic aberrations include inversions, which give rise to bridge configurations at I anaphase. In *Pinus nigra* v. *austriaca* up to 5 per cent. bridges were found. There is very little sterility in the pollen grains.

12.11.3 : 12.25 : 12.11.23 : 12.14.6. LANGLET, O. Kulturförsök med tysk gran av första och andra generationen. [**Cultural experiments with German Spruce of the first and second generation.**] *Medd. Skogsförsöksanst. Stockh.* 32, 1940–41 (361–80). [Sw.sw.g.] E.F.A.

The investigations described showed that in the main the differences observed in one-year seedlings (notably in the dry weight and the water content of the crown) were at least as great between south-Swedish Spruce and second-generation German Spruce grown in southern Sweden as between the former and first-generation Spruce of Central European provenances grown in southern Sweden.

12.11.3 : 12.26–8. GRAVES, A. H. **Report on Chestnut breeding.** *For. Leaves* 32 (6), 1942 (15–6).

Since work on Chestnut breeding began at Hamden, Connecticut, in 1930, 48 new hybrid combinations have been obtained. Owing to lack of sufficient available land at the original site, co-operative plantations have been established on the land of responsible interested

* A Norway Spruce with heavy main branches and with secondary branches spreading out in one plane on each main branch (—as defined in *Bull. Yale Univ. Sch. For.* No. 40. Swedish-English Vocabulary for Foresters).

persons. In addition to increasing the total number of trees, this scheme has the advantage of allowing trees to be tested in different soils and under various conditions. More than 100 young trees of *Castanea dentata* are at present in the Hamden plantations. They are being tested for disease resistance, and, if results are favourable, will be used for breeding stock.

12.11.6. *Phenomena of Movement*

12.11.6. Seifriz, W. **Protoplasmic streaming.** *Bot. Rev.* 9, 1943 (49–123). [University of Pennsylvania.]

12.11.6 : 12.26–8. Blum, G. **Osmotic investigations on the Mangrove.** *Berl. schweiz. bot. Ges.* 51, 1941 (401–22). [G.] Chem. Abstr. 36 (5855). P.R.

Osmotic pressure measurements were made on Mangrove leaves and the substrate in which they grew in different localities, fresh water, sea water and brackish water. The difference between leaf osmotic pressure and substrate osmotic pressure remains about constant at 20 atmospheres, although the values of these vary widely in the different localities.

12.14. Organography. Morphology. Anatomy. Histology

12.14.3 : 12.11.23. Nesbitt, W. A. **Aerial roots from old tree wound.** *Plant Physiol.* 17, 1942 (689–90). [Appalachian Forest Exp. Sta., Asheville, N.C.] O.B.D.

Aerial roots were observed to originate from the live portion of an overmature Red Oak directly above an old wound, and also at one point midway up the side of the callused area. According to ring counts 11 years had elapsed since the killing of approximately one-third of the tree circumference from the ground line to an average height of 7 ft. The roots had a bark similar to that of ordinary roots and were independent of the parent tree except at their point of origin.

12.14.3 : 12.25 (71.3) : 12.11.22. Bannan, M. W. **Notes on the origin of adventitious roots in the native Ontario conifers.** *Amer. J. Bot.* 29, 1942 (593–8). [University of Toronto.] O.B.D.

Certain anatomical features of the origin of adventitious roots in the native Ontario conifers were studied from layered material collected in different parts of the province. The species studied represented the following genera:—*Taxus*, *Thuja*, *Juniperus*, *Abies*, *Picea*, *Larix*, *Pinus* and *Tsuga*. No layering was observed in *Pinus strobus*, *P. resinosa*, *P. banksiana* or *Tsuga canadensis*. Examination of a few hormone-treated cuttings of *Picea* indicated a type of root origin different from that observed in layered specimens.

12.14.4 : 12.11.23 : 31.27 : 31.23. Turnbull, J. M. **A study in stem design.** *J. S. Afr. For. Ass.* No. 9, 1942 (26–30). [Forest Products Institute, Pretoria.]

On the basis of the relative inherent strength of the wood of Pine and Spruce, and the different manner of its distribution in the two genera, the profile of a theoretical Spruce stem is plotted from data of specific gravity and diameter at successive heights in a Pine stem, appropriately converted for the purpose. The resemblance of this profile to that of an actual Spruce stem is held to support the principles on which the Pine diameters were converted. *Author's summary.*

12.14.4 : 12.25. Smith, R. A. **Natural graft of Hemlock.** *J. For.* 41, 1943 (72).

Records the natural graft of two separate Hemlocks, 14 and 16 in. d.b.h. and about 85 ft. high, which have grown as a single stem from about 18 to 36 ft. above ground.

12.14.8 : 12.11.11 : 12.26–8. Chiariotti, C. **Extraction of salicin from the bark of *Salix humboldtiana* Willdenow.** *Rev. Fac. Cienc. quim. La Plata* 16, 1941 (171–84). Chem. Abstr. 36 (5955). P.R.

The method is described. Bark from young twigs yielded about 3 per cent. salicin, bark from larger and older branches yielded less than 1 per cent. and old bark from trunks contained only traces.

12.14.8 : 12.25. Russell, L. **Unusual bark thickness on giant Sequoias.** *Yosemite Nature Notes* 21 (11), 1942 (92–4). U.S. D. A. Bibliog. (Plant Science) 1 (D–173).

12.14.8 : 12.26–8 : 31.3. Clothofski, E., and Junge, W. **Beech bark (*Fagus sylvatica*). II.** *Ber.* 74B, 1941 (1415–19). Chem. Abstr. 36 (5500). P.R.

Experiments are described which show that the non-hydrolyzable part of Beech bark must contain lignins or a component of very similar structure.

12.19. Geographical Distribution. Plant Geography and Sociology

12.19 : 01.7 : 01.4. Bauer, H. L. **The statistical analysis of chaparral and other plant communities by means of transect samples.** *Ecology* 24, 1943 (45–60). [Santa Monica Junior College, Santa Monica, California.]

Laboratory tests with cardboard discs of various colours (each colour representing a species and each disc an individual plant) were carried out in order to ascertain the relative accuracy of the transect and quadrat methods of sampling vegetation for statistical analysis. The sizes and approximate proportions were intended to resemble those found in the Californian chaparral. The transect method was also tried out under field conditions in an area where the percentage composition of species is known with a fair degree of exactness.

The transect method appears to have definite advantages over the quadrat in certain types of vegetation such as scrub or forest where the individual plants are large enough and sufficiently well defined to be measured quickly and accurately. In communities where the individuals were all of the same size (an unnatural condition) both methods gave results of equal accuracy, but in communities where the individuals were of different sizes, the transects gave more accurate results when the data were based on coverage measurements. In the case of communities composed of individuals of various sizes, the per cent. of the line covered in the transect samples was a more accurate indication of the true areal coverage in the entire assemblage than was the per cent. of the area covered with the quadrat samples. The transect method can be used to obtain data on coverage, numerical abundance and frequency, and it can also be adapted to show other structural characteristics of vegetation. It results in a great saving of time with no loss of accuracy.

12.19 (67) : 11.47.6 : 11.44. Thomas, A. S. **Ecological factors and indicator plants in tropical Africa.** *Chron. bot.* 7, 1942 (71). [Department of Agriculture, Kampala, Uganda.] O.B.D.

Correlation between the composition of a tropical forest and the type of soil on which it grows is very difficult to establish. The quality of a soil may be judged more readily from certain herbaceous species

which are useful as soil indicators: for example, an abundance of *Eragrotis* or *Loudetia* generally indicates a poor soil, while *Cynodon* will grow in quantity only on rich land.

12.19 (71.21) : 12.25 : 12.26–8. McClure, H. E. **Aspection in the biotic communities of the Churchill area, Manitoba.** *Ecol. Monogr.* 13, 1943 (1–35).

Over 400 species of invertebrate fauna were collected during the summer of 1936 in an ecological study of the Churchill area, Manitoba, which is on the border-line between the vast northern tundra and the transcontinental forests. The dominant plants of the tundra were lichens and reindeer mosses. These were accompanied in places by sub-dominant flowering plants. The only tree species reported from the area were *Salix glauca*, *Betula glandulosa*, *Picea mariana* and *Larix laricina*.

12.19 (77.4–5) : 12.19.2 : 12.25 : 12.26–8. Potzger, J. E. **The Lake Forest of northern Wisconsin and upper Michigan: A phytosociological study.** *Abstr.* in *Proc. Indiana Acad. Sci. 1941* 51, 1942 (75). [Butler University.] A.F.B.

A study was made of 11 forest stands, 9 of hardwoods and 2 of Pine. The characteristic association of *Pinus strobus* and *P. resinosa* varies in the importance of one or the other of these species with soil moisture of the habitat. *P. resinosa* is more prominent on dry, sandy uplands and *P. strobus* on moist sites. *Acer rubrum* constitutes the second layer tree stratum in the *P. resinosa* forest type and *Abies balsamea* in the *P. strobus* type. Dominants in the broadleaved forest are primarily *Acer saccharum*, *Betula lutea*, and *Tsuga canadensis*, while *Tilia glabra* is of secondary importance in the crown cover, occurring usually in isolated clumps. *Acer saccharum* assumes more prominence in the well-drained locations and *Tsuga canadensis* in the moist lowlands, while *Betula lutea* is of equal importance in both association types. *Betula* and *Tsuga* reproduce very abundantly on old logs while *Acer* is not able to invade decaying log habitats.

12.19 (943) : 12.19.2. Cromer, D. A. N., and Pryor, L. D. **A contribution to rain-forest ecology.** *Proc. Linn. Soc., N.S.W.* 77, 1942 (249–68). L.S.

An ecological study of rain-forest communities in the Mary Valley, south Queensland. The savanna woodland was included in the study in areas where it was adjacent to the rain forest, but was not studied for the district as a whole. In many places the rain forest appears to be encroaching on the savanna, the first stage being the establishment of colonizing species which are not always represented in the two main formations. The rain-forest flora contains a strong Indo-Malayan element. The two main associations are *Tarrietia*/*Syncarpia* and *Castanospermum*/*Grevillea*. The former includes a clearly defined *Syncarpia subargentea* consociation. A considerable portion of the rain forest which is not regarded as having attained stability is described as the *Araucaria* subclimax. Several brushwood tree species such as *Euroschinus falcatus*, *Flindersia australis*, and *Rhodosphaera rhodanthema*, as well as the predominant *Araucaria cunninghamii* regenerate strongly in the ecotone region. The rain-forest dominants, *Tarrietia argyrodendron* and *Syncarpia subargentea*, however, regenerate only under rain-forest canopy. A list of species is appended.

12.19 (729.7) : 12.26–8 : 12.19.2. Gunther, A. E. **The distribution and status of Mora forest (*Mora excelsa*) in the Ortoire basin, Trinidad, B.W.I.** *Emp. For. J.* 21, 1942 (123–7 + map). [Imperial Forestry Institute.]

This paper refers particularly to points discussed in R. C. Marshall's 'The Physiography and Vegetation of Trinidad and Tobago' (*Oxford Forestry Memoirs*, No. 17, 1934).

In the present survey four forest types are recognized —Mora Forest, Mora Mixed Forest, Mixed Forest with Mora and Mixed Forest. The main area of Mora Forest occupies the centre of the Ortoire Basin, following the courses of the two principal rivers. From here Mora has invaded the Mixed Forest along the flats bordering the secondary rivers resulting in an association classed as Mora Mixed Forest. Mora Forest dominates exclusively in flat and swampy areas, and representation of Mixed Forest species increases as drainage improves: on steep sandy ridges Mora is usually found in mixture with Mixed Forest dominants or may be entirely absent.

It is pointed out that while Mora is still spreading in certain areas, it is not merely a matter of succession—the Mora Forest following the Mixed Forest—but that Mora will invade only where conditions, notably moisture, are suitable and that Mixed Forest will remain dominant on those areas where conditions are unfavourable for Mora.

Mora and Mixed Forests can be differentiated on aerial photographs on the basis both of colour contrast and difference in height of the forest canopy.

12.19.1. *Regional Floras*

12.19.1 (6 : 902 : 7 : 8) : 01.6. Blake, S. F., and Atwood, A. C. **Geographical guide to floras of the world. Part I.** *Misc. Publ. U.S. Dep. Agric.* No. 401, 1942. pp. 336.

An annotated selected list of floras and similar works, including those in periodical literature, which relate to vascular plants, as well as publications dealing with useful and medicinal plants, vernacular names and botanical bibliography. In general only those works are included which describe or list the complete vascular flora of any region or locality. Part I deals with works relating to Africa, Australasia, North America, South America and islands of the Atlantic, Pacific and Indian Oceans. The arrangement adopted is geographical. The sub-titles are arranged alphabetically under general headings. Works covering the whole of a region are listed first, followed by works of a more local nature. A geographical index and an index of authors are provided. No titles later than 1939 have been included, but the list is comprehensive within its own limits. About 2,597 primary titles and 427 subsidiary titles are given.

12.19.1 (72). Lundell, C. L. **Flora of eastern Tabasco and adjacent Mexican areas.** *Contr. Univ. Mich. Herb.* No. 8, 1942 (5–74 + map).

An enumeration of the plants collected from May to July, 1939 in Tabasco and parts of Campeche and Chiapas in Mexico by E. Matuda. The collection is the first of importance to be made in the district, although the vegetation is not markedly different from that of adjacent areas. Some 700 species of trees, shrubs and herbs are listed with localities, dates and in many cases very brief notes. The first set of the collection is housed in the University of Michigan Herbarium.

No novelties are described, but references are given

to thirty-eight published elsewhere and based on Matuda's collection, and six new species are figures.
R. C. H.

12.19.1 (729.2). SHREVE, F. **The vegetation of Jamaica** *Chron. bot.* 7, 1942 (164–6). [Carnegie Institution, Tucson, Arizona.] O.B.D.

The moist lowlands and lower mountain slopes of Jamaica support a heavy forest which is rich in composition, although not as rich as similarly situated forests on the mainland. The chief tree genera are *Comocladia, Ternstroemia, Pithecolobium, Eugenia, Zanthoxylum, Piscidia, Lonchocarpus, Bauhinia, Calyptranthes, Miconia, Muntingia* and *Trichilia*. The stature of this forest generally decreases with increasing altitude. The forest composition of the high mountain regions in relatively simple, the commonest trees being *Clethra occidentalis, Vaccinium meridionale* and *Podocarpus urbanii*. On the south face of the Blue Mountains there is a variety of tree species greater than in corresponding forests on the north. Species found here include *Eugenia marchiana, Cleyera theoides, Alchornea latifolia, Turpinia occidentalis, Xylosma nitidum, Trichilia havanensis, Cupanea glabra, Laplacea haematoxylon, Miconia dodecandra, Guarea glabra* and many others. The only conifer is the infrequent *Juniperus barbadensis*. The semi-arid, open forest of the Liguanea Plain contains *Bursera simaruba, Haematoxylon campechianum, Piscidia piscipula, Prosopis juliflora* and *Acacia villosa*. In the limestone region of the centre and northwest are found many tree genera, including *Erythroxylon, Pithecolobium, Ternstroemia, Ceiba, Exothea, Calyptranthes, Eugenia, Miconia, Cassia, Lonchocarpus, Piscidia, Zanthoxylum, Amyris, Trichilia* and *Malvaviscus*.

12.19.1 (75.4–5) : 12.25 : 12.26–8. FRYE, W. M. **Notes on the flora of the South Branch Valley.** *Castanea* 7, 1942 (118–22).

A list of some of the rarer species found in the South Branch Valley, which extends about 125 miles into the Allegheny Mountains northeast of Monterey, Virginia. There are marked variations in soil types, slopes, drainage conditions and temperature. Elevation varies from 535 to 4,860 ft.

12.19.1 (75.5). **Common forest trees of Virginia. how to know them.** *Publ. Va. For. Serv.* No. 26, (10th edition) 1940. pp. 64.

12.19.1 (75.5) : 12.26–8. FERNALD, M. L. **The seventh century of additions to the flora of Virginia.** *Rhodora* 44, 1942 (341–405, 416–52, 457–79 + plates.) O.B.D.

Includes notes on *Quercus alba*, × *Q. fernowi* Trelease (*Q. alba* × *stellata*), *Q. lyrata* Walt., forma *viridis* Trelease, *Q. palustris* DuRoi, *Q. nigra* L. var. *tridentifera* Sargent, and *Q. phellos* L. forma *intonsa* f. nov.; also on *Acer floridanum* (Chapm.) Pax, *A. floridanum* forma *villipes* stat. nov., *A. floridanum* var. *longii* var. nov., and *A. floridanum* var. *longii* forma *platylobum* f. nov.

12.19.1 (79.4). HOWELL, J. T. **A key to the indigenous and naturalized trees of Marin County, California.** *Wasmann Collector* 5 (1), 1942 (17–24). [California Academy of Science, San Francisco.] *Biol. Abstr.* 17 (6681).

12.19.1 (82) : 12.24 : 12.25 : 12.29. CASTELLANOS, A., and PÉREZ-MOREAU, R. A. Contribucion a la bibliografía botánica Argentina, I. **[Contribution to the botanical bibliography of Argentina, I.]** *Lilloa* (*Tucumán*) 6 (1), 1941 (5–161). [Span.] Biol. Abstr. 17 (2510).

A bibliography of the species of vascular plants of Argentina from Linnaeus' time to the end of 1937. Part I includes general works and the Pteridophyta, Gymnospermae, and Monocotyledoneae.

12.19.1 (86) : 12.2.6–8. Anotaciones sobre la vegetacion del norte de Quito: desde Cotocollao y San Antonio hasta el Rio Guayllabamba. **[Notes about the vegetation on the northern side of Quito: from Cotocollao and San Antonio to Guayllabamba River.]** Imperial de la Universidad, Quito, Ecuador. 1942. pp. 117 + 2 maps. [Span.e.] Biol. Abstr. 17 (709).

The area consists largely of desert, semi-desert and irrigated districts, the vegetation being mainly xerophytic in character. The chief vegetational types are: (1) chaparral of the 'quebradas' or desert arroyos which are well watered only during the rainy season; (2) climax arboretum along the streams; (3) semi-desert vegetation; (4) woody shrubs of the sandy pampas. *Eucalyptus* spp. are grown fairly extensively for wood and building materials, but lack of water is a limiting factor for all species.

12.19.1 (86). SCHERY, R. W. **A few facts concerning the flora of Panama.** *Chron. bot.* 7, 1942 (77–9). O.B.D.

Geologically speaking, the flora of Panama is of recent origin. On the Pacific side occur savanna lands and widely-spaced forests, but on the Atlantic side the forests are denser and there are no savannas. Much of the coast vegetation consists of Mangrove swamp. In the humid lowlands, where vegetation is dense, the tree genera include *Chrysophyllum, Andira* and *Ficus*. The highland region of the interior supports a more temperate type of vegetation including Oaks, Melastomes and Rubiaceae. Naturalized plants include *Cocos, Artocarpus, Mangifera, Garcinia, Annona* and *Carica*, and to a lesser extent *Musa, Hevea*, and *Coffea*.

12.19.1 (88) : 31.2 : 33.0. STAHEL, G. De nuttige planten van Suriname. **[The useful plants of Suriname.]** *Bull. Dep. Landbouproefsta., Suriname, Paramaribo* No. 57, 1942. pp. 197. [Du.] *Abstr.* in *Trop. Woods* No. 73, 1943 (45).

The bulletin, which deals with both wild and cultivated plants, is divided into three sections. Part II is concerned with 56 important trees, and includes check lists of the vernacular and scientific names as well as classifications according to the principal properties and uses of the woods.

12.19.1 (943). BLAKE, S. T. **The vegetation of the lower Stanley River basin.** *Proc. R. Soc. Qd.* 52, 1941 (62–77 + plates). L.S.

In the lower part of the Stanley River basin four main vegetational types may be distinguished:—(1) open forest, (2) closed forest, (3) fringing forest and other fringing communities, and (4) aquatic vegetation. The major communities present in the open forest are: mixed Eucalypts; *Eucalyptus umbellata/Angophora subvelutina*; *E. hemiphloia*; *Angophora lanceolata*; *E. maculata/E. racemosa*; *E. racemosa/Casuarina torulosa/Xanthorrhoea arborea*; *E. carnea/E. punctata*; *E. punctata/E. paniculata*?/*Tristania conferta*; as well as communities consisting mainly of herbaceous plants on very rocky places on hillsides. The closed forests are, broadly speaking, of two main types—Pine 'scrubs' and isolated 'scrubs'. The former occupy the larger

continuous areas on mountain sides and the more or less sheltered habitats. In some communities the Hoop Pine (*Araucaria cunninghamii*) is by far the tallest tree and completely dominates the forest. The isolated 'scrubs' occur usually on particularly rocky sites. The trees and shrubs are the same as those of the Pine forest but the species are not so varied. The chief trees of the fringing' forest are *Tristania suaveolens*, *Casuarina cunninghamiana* and *Melaleuca bracteata*. The aquatic vegetation was not studied in detail.

Two lists of species are given, the first containing all species recognized in the closed forests and their ecotones, the second comprising those species found in other communities.

12.19.2. *Forest Types*

12.19.2 (66.9) : 09.1 : 91. LAMB, A. F. A. **The kurmis of northern Nigeria.** *Farm and Forest* 3, 1942 (187–92).

Kurmis are isolated patches of high forest occupying favourable sites throughout the Middle Belt of Northern Nigeria. Their existence is due mainly to protection by man or to particularly favourable conditions of climate and soil. Kurmis due to the protection of man usually consist of a small area of fringing forest along a stream and adjacent to a village; without firé protection these forests would have been of a closed-savanna woodland type. Species most common in kurmis of this sort are *Cola cordifolia*, *Ceiba pentandra*, *Antiaris africana*, *Chlorophora excelsa*, and on certain soils *Khaya grandifoliola*, *Anogeissus schimperi* and *Diospyros mespiliformis*. Some of the smaller areas have been greatly improved silviculturally by the natives who remove lower-storey trees for fuelwood and house poles.

While timber exploitation is going on in many of these areas, certain others that are relatively inaccessible (about sixty per cent. of the whole) will remain intact after the war. Problems relating to the future policy for these forests are discussed briefly.

12.19.2 (75.4–6) : 12.19.4 : 09.2. BRAUN, E. L. **Mixed deciduous forest of the Appalachians.** *Virginia J. Sci.* 1 (1), 1941 (1–4). [University of Cincinnati.] Biol. Abstr. 17 (4240).

12.19.2 (75.6) : 12.25 : 12.19.4 : 43. BUELL, M. F., and CAIN, R. L. **The successional rôle of Southern White Cedar, *Chamaecyparis thyoides*, in southeastern North Carolina.** *Ecology* 24, 1943 (85–93). [North Carolina State College, Raleigh.]

Southern White Cedar (*Chamaecyparis thyoides*) is a pioneer forest community on deep, open peat bogs underlain by sand on the coastal plain of southeastern North Carolina. Normally, areas of this type are covered with luxuriant woody vegetation, and, as *C. thyoides* requires decidedly open conditions for reproduction, its establishment is dependent upon fire at a time of high water table when the surface peat containing the seeds would escape burning. The Cedar forest itself is extremely susceptible to fire, but, if protected, will in time give place to a bog climax of Swamp Bay (*Persea pubescens*) with which are associated such species as *Magnolia virginiana*, *Cyrilla racemiflora* and *Ilex myrtifolia*.

12.19.2 (79.5) : 12.25 : 12.26–8 : 09.4. MASON, E. G. **The forests of Oregon.** *Leafl. Ore. Sch. For.* No. 2, 1942. pp. 7.

Notes are given on the main forest types of Oregon and on the chief tree species of commercial importance. These include *Pseudotsuga taxifolia*, *Pinus ponderosa*, *Tsuga heterophylla*, *Thuja plicata*, *Chamaecyparis lawsoniana*, *Pinus lambertiana*, and *Picea sitchensis*. The forests contain approximately 397 billion bd. ft., of which 54 billion bd. ft. are considered of too low quality or too inaccessible to be logged profitably. The importance of the forests to the community is emphasized.

12.19.2–4 (46). CEBALLOS Y FERNANDEZ DE CORDOBA, L. Aperçu des types de forêt et de végétation en Espagne. **[Summary of vegetation- and forest-types in Spain.]** *Intersylva* 2 (1), 1942 (1–11 + maps). [F.e.] U.S.D.A. Bibliog. (Plant Science) 2 (D–8).

12.2. *Special* [*Systematic*] *Botany*

12.2 : 07.5. RAIZADA, M. B. **Hints for botanical collectors.** *Indian For. Bull.* (*n.s.*) *Botany* No. 109, 1942. pp. 9. [Forest Research Institute, Dehra Dun.]

12.21. Fungi

12.21 : 12.11.23 : 11.44. TRESCHOW, C. Zur Kultur von *Trametes* auf sterilisiertem Waldhumus. **[On the culture of *Trametes* on sterilized forest soil.]** *Zbl. Bakt.* 104 (8/10), 1941 (186–8). [G.] R.A.M. 22 (120).

In experiments at the Royal Veterinary and Agricultural College, Copenhagen, *Trametes radiciperda* (*Fomes annosus*) failed to grow on acid (pH 4·2) forest humus from a 70-year-old Spruce stand in the natural state, but developed satisfactorily on the same medium subjected to pasteurization or sterilization. No growth was made on autoclaved soil inoculated with *Trichoderma* sp., but the introduction of *Bacillus subtilis* or *Actinomyces* sp. into the substratum did not impede the vigorous development of *F. annosus*. Presumably the inability of the latter to grow on the natural humus is a result of its weakness as a competitor with other fungi.

12.21 : 12.14 : 44.3. HILBORN, M. T. **The biology of *Fomes fomentarius*.** *Bull. Me. agric. Exp. Sta.* No. 409, 1942. pp. 214 + plates.

F. fomentarius has been reported from most of the North American Continent, the British Isles, northern and central Europe, China, Japan, and northern Africa. It has been reported on 23 genera and 56 species of trees, mostly hardwoods.

This account of the fungus includes sections on synonymy, distribution and hosts, the sporophore, spore discharge, general cultural studies with artificial media, aversion between diploid cultures, cultural studies on wood, and natural decay.

Cultural studies with 28 isolates from various sources gave no indication of the existence of strains or local races within the species. While the fungus destroyed heartwood and sapwood at equal rates in cultures, different isolates varied in the rapidity with which they destroyed wood from the same source. Field studies on infected trees showed that the fungus causes a typical, white mottled rot in the heartwood and sapwood of both living and dead trees. Chemical studies on decayed wood showed that the fungus attacked lignin and cellulose simultaneously. Losses in the calorific value of the decayed wood were proportional to the losses in dry weight.

12.21 : 12.14.7 : 21.9. HARRISON, C. H. **Longevity of the spores of some wood-destroying Hymenomycetes.** *Phytopathology* 32, 1942 (1096–7).

Results from investigations (suspended during the war) on the viability of spores of the following species:—*Stereum hirsutum, S. rugisporum, S. sanguinolentum, Polyporus schweinitzii, P. abietinus, Fomes igniarius, F. pinicola, Trametes pini, Pleurotus ostreatus, Coniophora sistotremoides* and *Hymenochaete tabacina.*

12.21 : 12.19 : 44.3 : 12.26–8. WOLLENWEBER, H. W. *Diplodia sarmentorum* Fries und ihre Verbreitung. **[*Diplodia sarmentorum* Fries and its distribution.]** *Zbl Bakt.* 103, 1941 (347–57.) [G.g.] [Mykologisches Laboratorium der biologischen Reichsanstalt für Land- und Forstwirtschaft Berlin-Dahlem.] H.S.B.

A diagnosis of *Diplodia sarmentorum* Fries, a fungus which is widely distributed in Europe and in temperate (especially western) North America, and which has been observed on at least 150 different host plants, mainly trees and shrubs. It generally attacks dead twigs, wood and bark, but it is also found on leaves and fruit. Some of the more common trees known to act as host plants are *Acer, Alnus, Castanea, Fagus, Ficus, Fraxinus, Ilex, Juglans, Juniperus, Picea, Platanus, Populus, Prunus, Quercus, Salix, Thuja* and *Ulmus.* Numerous references are given.

12.21 : 13.2 : 12.26–8. SILVER, W. H. **The fungus flora of an insect gall.** *Abstr.* in *Proc. Indiana Acad. Sci. 1941* 51, 1942 (75). [Purdue University.] A.P.B.

A note on species of fungi isolated from the galls of *Pemphigus vagabundus* on Poplar.

12.24. Pteridophytes

12.24 (729.9). STEHLÉ, H. Catalogue des Cryptogames vasculaires des Antilles françaises. **[Catalogue of vascular Cryptogams of the French Antilles.]** *Carib. For.* 4, 1942 (35–47, 83–98). [F.e.span.]

The catalogue contains a systematic enumeration of the Pteridophytes and vascular cryptogams collected in Guadeloupe and Martinique by the author and several other collectors.

12.25. Gymnosperms

12.25 : 12.14.7 : 12.12. MORTON, C. V. **Notes on *Juniperus*.** *Rhodora* 43, 1941 (344–8). [U.S. National Museum, Washington.] O.B.D.

The exserted seed of some Junipers is stated to be neither a generic, specific, nor varietal character, but a teratological condition brought about by parasitic insects, probably of the genus *Eriophyces.* Notes are given on the synonomy of *Juniperus tetragona* Schlecht. and *J. deppeana* Steud. It is suggested that *J. monosperma* (Engelm.) Sarg., named *J. mexicana* var. *monosperma* by Cory, may correctly be given specific rating, but that *J. scopulorum* Sarg., in which almost the only difference from *J. virginiana* L. is in the longer ripening time of its fruits, should be more appropriately named *J. virginiana* var. *scopulorum* (Sarg.) Lemmon.

12.25 (72). BLANCO, C. E. Los pinos de México. **[The Pines of Mexico.]** *México Forestal* 19 (1/2), 1941 (7–10). [Span.) Biol. Abstr. 17 (2772).

The following species are described:—*Pinus teocote, P. teocote* var. *macrocarpa, P. montezumae* (and vars. *lindleyi* and *rudis*), *Pinus* sp. undetermined (has 6 needles in a fascicle), *P. leiophylla, P. ayacahuite* var. *brachyptera, P. lumholtzii, Pseudotsuga mucronata* and *Abies religiosa.*

12.25 (72) : 12.19 : 31.2. MARTÍNEZ, M. Una nueva Pinacea mexicana: *Picea chihuahuana* sp. nov. **[A new member of Pinaceae from Mexico: *Picea chihuahuana* sp. nov.].** *An. Inst. Biol.* 13 (1), 1942 (31–4). [Span.] *Abstr.* in *Trop. Woods* 73, 1943 (43).

The new species of Spruce is a tree 80 to 100 ft. tall and 18 to 24 in. in diameter growing in humid and shady localities along arroyos at elevations of about 7,500 ft. above sea level in the State of Chihuahua, Mexico. The wood is white and slightly resinous.

12.25 (72) : 12.19 : 34.26 : 31.2. MARTÍNEZ, M. Una nueva Pinacea mexicana: *Pinus durangensis* sp. nov. **[A new Mexican Pine: *Pinus durangensis* sp. nov.]** *An. Inst. Biol.* 13 (1), 1942 (23–9). [Span.] *Abstr.* in *Trop. Woods* 73, 1943 (45).

Pinus durangensis Martínez is the name proposed for a medium-sized to large Pine tree first collected in 1906 by G. R. Shaw on Sandía Mesa in the State of Durango. The tree yields some turpentine and a light-coloured, moderately hard wood of good quality for structural purposes, but the occurrence of the stands at high elevations (8,000 to 9,000 ft.) makes exploitation difficult.

12.25 (729) : 23.2 : 21. HOLDRIDGE, L. R. **Comments on the silviculture of *Cedrela*.** *Carib. For.* 4, 1943 (77–80). [E.] [Société Haitiano-Americaine de Developpement Agricole, Port-au-Prince, Haiti.]

The writer suggests that endeavours be made to bring to maturity 5 trees per acre, on the average, of *Cedrela* in every forest plantation within the natural range of that species and wherever the component species of the plantation would be compatible with it. The establishment of pure *Cedrela* plantations in the West Indies has not, so far, proved a success.

12.25 (77.8) : 21.12 : 21.2. **Canadian versus Carolina Hemlock.** *Bull. Mo. Bot. Gdn.* 30, 1942 (189–90). L.S.

Canadian Hemlock (*Tsuga canadensis*) is the only one of the four species of Hemlock indigenous to North America that can be grown in Missouri. The other species are not able to survive the dry hot summer weather.

12.25 (945) : 12.19. HUNTER, W. **The Mountain Plum Pine of Goonmirk, East Gippsland.** *Vict. Nat.* 58, 1941 (9–10). O.R.S.

A short description of *Podocarpus alpina* R. Br., a small tree attaining a height of 20 to 25 ft., which is found growing in abundance among Mountain Grey Gums over an area of more than an acre on the north side of the east branch of the Delegete River, East Gippsland.

12.26–8. Dicotyledons

12.26–8. FLODERUS, B. ***Salix rotundifolia* Trautv. and *Salix nummularia* Anderss.** *Svensk bot. Tidsskr.* 35 (4), 1941 (351–2). Biol. Abstr. 17 (6537).

On the basis of Hultén's previous collection of *S. rotundifolia* it is concluded that *S. nummularia* is clearly distinguishable from that species. Several writers have earlier suggested they were identical.

12.26–8. GILLY, C. L. **Studies in the Sapotaceae. II. The Sapodilla-Níspero complex.** *Trop. Woods* No. 73, 1943 (1–22). [New York Botanical Garden.]

Because of the trend of fusion of the exterior staminodes, and because vegetative, fruit, seed and perianth characters are fundamentally the same in both groups, there appears to be no valid reason for maintaining the Sapodilla-Níspero (*Achras*) complex and the Balata (*Manilkara*) complex as separate genera. It is suggested

that, in the interests of a stabilized nomenclature, the three presently-accepted species of *Achras* should be transferred to the genus *Manilkara*. Keys to the sub-genera, species, and varieties of *Manilkara* are included.

12.26–8. KUHLMANN, J. G. **Rubiaceae: *Dialypetalanthus* Kuhlmann.** *Rodriguesia* 6 (15), 1924 (25–6 + plate). [Port.] A.P.B.

The genus *Dialypetalanthus*, although closely related to the tribe Cinchoneae, particularly with regard to the position of its ovules, cannot be included in this tribe on account of its free petals and the relationship between the number of stamens (15–25) and the number of segments of the corolla (4). The inclusion of the present genus in the sub-family Cinchonoideae would necessitate the forming of the tribe Dialypetalantheae.

12.26–8. PIERCE, J. H. **A new *Dussia* and *Ormosia avilensis*.** *Bull. Torrey bot. Cl.* 69, 1942 (590–1). O.B.D.

The original description of *Ormosia avilensis* Pittier is bigeneric, the foliage and fruit being those of *Ormosia* and the flower that of *Dussia*. The author suggests a method for clarifying the situation and describes *Dussia coriacea* Pierce, sp. nov.

12.26–8 : 01.2. REDMAN, K. **Nomenclature confusion of *Populus candicans* Aiton.** *J. Amer. pharm. Ass.* (*sci. ed.*) 31, 1942 (140–1). [University of Toledo, Toledo, Ohio.] L.S.

Balm-of-Gilead Poplar was first given specific rank as *Populus candicans* by Aiton in 1789. Since then it has been classed by different authorities as (*a*) a variety *P. balsamifera*, (*b*) synonymous with *P. balsamifera*, (*c*) *Aigeiros candicans*, (*d*) a hybrid, (*e*) *P. tacamahaca*, and (*f*) a clone of *P. tacamahaca* (Stout, 1929).

12.26–8 : 12.11.23 : 12.14.7. RAO, L. N. **Studies in the Santalaceae.** *Ann. Bot., Lond.* 6 (21), 1942 (151–75 + plate). [Queen Mary College, University of London.] L.S.

Studies were made of the development of the floral parts, the embryo-sac, and the endosperm and embryo of four Indian species of Santalaceae:—*Santalum album*, *Thesium wightianum*, *Osyris arborea*, and *Scleropyrum wallichianum*.

12.26–8 : 12.14 : 23.23.19 : 12.11.23. KAUSIK, S. B. **Studies in the Proteaceae. VI. Structure and development of the seedling of *Grevillea robusta* Cunn.** *J. Indian bot. Soc.* 21, 1942 (145–58). [Central College, Bangalore.] O.B.D.

This paper is concerned with a detailed study of the vascular anatomy and early development of seedlings of *G. robusta* grown in ordinary garden soil under greenhouse conditions or in sterilized sawdust in the laboratory. The seed required about a fortnight for germination. Shortly after the emergence of the radicle a knob-like swelling due to localized cortical growth appeared at the base of the hypocotyl in some seedlings. This swelling played an important rôle in the opening of the seedcoat during germination. The cotyledons often persist until a late stage in development: some withered ones were observed on 6-months'-old seedlings.

12.26–8 : 12.14.2 : 44.2. RAO, L. N. **Parasitism in the Santalaceae.** *Ann. Bot., Lond.* 6 (21), 1942 (131–40 + plate). [Queen Mary College, University of London.] L.S.

The structure of the haustoria of *Santalum album* and of other members of the Santalaceae is described in detail. Connexion between the xylem elements of the haustorium and those of the host appears to be brought about by apposition of the pit-apertures rather than by penetration. Compound haustoria, consisting of several superimposed simple haustoria, are sometimes found on roots which are difficult to penetrate. In both types of haustorium there is glandular activity of the surface layers, but, where penetration fails, a temporary internal gland may be developed also. Most haustoria are short-lived, but if the host species displays a great degree of tolerance of the parasite, secondary growth may make the haustorium into a permanent structure capable of functioning for a long time.

12.26–8 : 12.14.5. GROVER, F. O. **The phyllotaxy of *Catalpa*.** *Rhodora* 44, 1942 (414–6). [Oberlin College, Oberlin, Ohio.] O.B.D.

Of more than 2,000 young trees of *Catalpa speciosa* which were examined, 88·5 per cent. had their leaves in whorls of three.

12.26–8 : 12.19.1. KURENTSOVA, G. E. **The Mongolian Oak (*Quercus mongolica* Fisch.) and its rôle in the vegetation of Suputinka River basin.**] *Trudy Gornotaezhnoi Stantsii Dal'nevostochnogo Filiala Akademii Nauk SSSR* 3, 1939 (65–105). [Russ.e.] Biol. Abstr. 17 (689).

12.26–8 : 24.4 : 12.11.22–3. REINECKE, O. S. H., and WICHT, C. L. **A semi-evergreen form of Lombardy Poplar.** *J. S. Afr. For. Ass.* No. 9, 1942 (19–22 + plate). [University of Stellenbosch.]

The tree, which has been introduced into South Africa from the Argentine, shows considerable promise, particularly for use in shelterbelts to protect orchards. It is easily propagated by cuttings, shows fast early growth, and has a root system that is less likely than that of other evergreen trees to encroach on orchard land. It is suggested that it may be a mutant of *Populus nigra* L. var. *italica* du Roi.

12.26–8 : 31.0. ESPINOSA, M. R. Apuntes botanicos. Sobre el belloto chileno de frutos comestibles (*Beilschmiedia berteroana* [Gay] Kosterm.). **[Botanical notes. On the Belleto of Chile with edible fruit (*Beilschmiedia berteroana* [Gay] Kosterm.).]** *Bol. Mus. nac. Hist. nat.* (*Santiago de Chile*) 19, 1941 (9–18 + plates). [Span.] *Abstr.* in *Trop. Woods* No. 73, 1943 (46).

A detailed account of this rather large, aromatic tree which seems worth planting for decorative purposes and for its fruit. The cream-coloured wood is used in general carpentry and for fuel.

12.26–8 (469) : 12.19 : 34.24. AMORIM GIRAO, A. DE. Distribuição antiga do sobreiro em Portugal. **[Former distribution of the Cork-tree in Portugal.]** *Bol. Junta Nac. da Cortica* (*Portugal*) No. 44, 1942 (5–7 + map). [Port.] U.S.D.A. Bibliog. (Plant Science) 1 (D–208).

12.26–8 (54) : 12.19. MAJUMDAR, G. P. **The White Sandal.** *Sci. & Cult.* 6, 1940–41 (492–5). [Presidency College, Calcutta.] L.S.

Evidence is presented in support of the statement that White Sandal (*Santalum album*) is indigenous to India.

12.26–8 (59.3) : 12.19. BARNETT, E. C. **The Fagaceae of Thailand and their geographical distribution.** *Trans. bot. Soc. Edin.* 33, 1942 (327–43). O.R.S.

The family Fagaceae is represented in Thailand by three genera:—*Quercus* Linn., *Lithocarpus* Blume, and *Castanopsis* Spach. Sixty-nine species have been

recorded of which twenty-two belong to *Quercus*, thirty-one to *Lithocarpus*, and sixteen to *Castanopsis*. Thirteen species are endemic, of which five belong to *Quercus*, seven to *Lithocarpus*, and one to *Castanopsis*. Comprehensive keys are given for genera and species.

From the data available it appears that the largest number of species occurs in the northern area of the country, followed by the peninsular, southern and eastern areas in that order. The non-endemic species are related to the floras of four main Asiatic regions:—Indo-Burmese, Chinese, Indo-Chinese and Malayan. The closest relationship appears to be with the Indo-Burmese flora.

12.26–8 (7). McVAUGH, R. **Campanulales: Campanulaceae (Lobelioideae).** *North American Flora* 32 A (1), 1943 (1–134). [N.Y. Bot. Garden.] *Abstr.* in *Trop. Woods* No. 73, 1943 (43).

Descriptions of all the North American species of the 15 genera of the Lobelioideae, which are annual or perennial herbs, shrubs or small trees, usually with a milky sap.

12.26–8 (72). MARTÍNEZ, M. Una Rubiaceae nueva de México. **[A new member of Rubiaceae from Mexico.]** *An. Inst. Biol.* 13 (1), 1942 (35–41). [Span.] *Abstr.* in *Trop. Woods* No. 73, 1943 (44).

An account of *Balmea stormae* Martínez first described in *Bull. Torrey bot. Cl.* 69, 1942 (438–41). [Cf. *For. Abstr.* 4 (158).]

12.26–8 (72 : 728 : 8). SMITH, A. C. **The American species of *Drimys*.** *J. Arnold Arbor.* 24, 1943 (1–33). [Arnold Arboretum.]

A taxonomic revision of the American species of *Drimys*, the only genus of Winteraceae found in both hemispheres. The American representatives of the genus are shrubs or low trees usually occurring in cool, moist, temperate forest. They are hermaphrodite, whereas the Old World species are dioecious or polygamodioecious. *Drimys* is distinguished from other members of the Winteraceae by having a calyx which completely encloses the bud, composed of 2 (or rarely 3) sepals which are papyraceous to membranaceous in texture.

There is included key to the American species, which consist of 4 main types and their varieties:—(1) *Drimys confertifolia*; (2) *D. winteri*, with varieties *punctata*, *andina* and *chilensis*; (3) *D. granadensis*, with varieties *grandiflora*, *uniflora*, *mexicana*, *chiriquiensis* and *peruviana*; and (4) *D. brasiliensis*, with varieties *campestris retorta*, *angustifolia* and *roraimensis*.

12.26–8 (729). KOBUSKI, C. E. **Studies in the Theaceae, XIV. Notes on the West Indian species of *Ternstroemia*.** *J. Arnold Arbor.* 24, 1943 (60–76). [Arnold Arboretum.]

More than 20 species of *Ternstroemia* are included in the key which is based largely on that compiled by Urban in 1876 [*Bot. Jahrb.* 21 (521–44).] Some of the species have, however, been reduced to synonomy on account of the minor and variable characters said to distinguish them. A pubescent species of *Ternstroemia* from Santo Domingo (*T. pubescens*) is mentioned, it is believed for the first time.

12.26–8 (729.5) : 56 : 21 : 31.0 : 60.3. WADSWORTH, F. H. **Roble, a valuable forest tree in Puerto Rico.** *Carib. For.* 4, 1943 (59–76). [E.e.span.] [Tropical Forest Exp. Sta.]

Data on the silviculture, growth and management of *Tabebuia pallida*, a species which can be cheaply established under prevailing conditions, and which grows rapidly on the type of land available for forestry. Its strong wood is used in general construction and the making of tool handles, ox-carts, and other farm implements.

12.26–8 (73) : 34.27 : 44.3 : 45.3 : 12.11.2. FLETCHER, W. F. **The native Persimmon.** *Fmrs.' Bull. U.S. Dep. Agric.* No. 685, (revised ed.) 1942. pp. 22.

The Persimmon tree (*Diospyrus virginiana* L.) is native to the southeastern quarter of the United States. At present the fruit is not widely used for human consumption, although a few growers in the vicinity of large cities have succeeded in creating a market for it. Probably the most common use is as feed for hogs. The wood is used mainly for golf-club heads, and, to a lesser extent, for shuttles. The species is suitable for erosion control, but the recent appearance of a wilt caused by a fungus of the genus *Cephalosporum* has so far prevented its use for this purpose on a large scale. Its most important insect enemy is the Hickory twig girdler, *Oncideres cingulata* Say. Propagation may be carried out by means of seed, cuttings, or budding and grafting. Recipes for the use of the fruit pulp in cookery are appended.

12.26–8 (75.8–9). BALL, C. R. ***Salix floridana* Chapman, a valid species.** *J. Arnold Arbor.* 24, 1943 (103–6 + plate). [U.S. Department of Agriculture.]

Includes a detailed description of the relatively rare species, *Salix floridana*, from Florida and southern Georgia, now apparently on the verge of extinction, and brings together the synonymy of the species since the first available records in 1860.

12.26–8 (75.9) : 56 : 21.0 : 31.0. LYNCH, S. J., and WOLFE, H. S. **Future may see Mahogany forests in Florida.** *Florida Gr.* 50 (8), 1942 (6, 11).

There are good prospects for the production of Rhodesian Mahogany (*Khaya nyasica*) in southern Florida. In experimental plots this species has shown a marked superiority in growth over the native *Pinus caribaea*. The girth of *Khaya* trees was almost twice as great at 9 years, and more than twice as great at 10 and 11 years of age as that of Pines of equal age, while at all three ages the *Khaya* produced a volume of potential log material rather more than 5 times that produced by the Pines. The species has survived low temperatures with the loss of only a few leaves and, so far, has shown no sign of injury from insects or diseases. It produces a good quality, termite-resisting timber, and is used in its native land (Nyasaland and eastern Northern Rhodesia) for furniture and decorative work as well as for general building construction.

12.26–8 (76.4 : 72 : 728.2). LUNDELL, C. L. **Studies of American spermatophytes—III. Plants of Texas, Chiapas, and British Honduras.** *Contr. Univ. Mich. Herb.* No. 8, 1942 (75–88 + plates).

Descriptions include two tree species found in advanced forest in Chiapas (Mexico)—*Colubrina mollis* Lundell, sp. nov. (12 to 15 m. high), occurring at 1,200 m., and *Aegiphila wigandioides* Lundell, sp. nov. (7 m. high), occurring at 1,600 m.; also *Solanum gentlei* Lundell, sp. nov., a small tree found growing on a high ridge between river and Pine land in the Toledo District of British Honduras. [Cf. *For. Abstr.* 4 (158–9).]

12.26–8 (77.8). STEYERMARK, J. A. **Notes on Missouri plants.** *Rhodora* 43, 1941 (658–63). O.B.D.

Includes short notes on *Populus deltoides* Marsh., f.

pilosa (Sarg.) Palmer & Steyermark, comb. nov., and *Acer nigrum* Marsh., f. *pubescens* Deam.

12.26–8 (82). LOURTEIG, A. **Acalypheae Argentinae (Euphorbiaceae).** *Lilloa* (*Tucumán*) 8 (1), 1942 (273–333 + plates + map). *Abstr.* in *Trop. Woods* No. 73, 1943 (46–7).

A systematic account of the Argentine species of the euphorbiaceous genera *Acalypha*, *Adelia*, *Alchornea*, *Bernardia*, *Dysopsis*, and *Mercurialis*. There is a description of one new species, *Acalypha schreiteri* Lillo, a shrub or small tree growing in Jujuy and Tucumán.

12.26–8 (943) : 31.0 : 34.26. **Queensland Gum trees. Scribbly Gum or White Gum (*Eucalyptus micrantha*).** *Qd. agric. J.* 56, 1941 (483–5). L.S.

E. micrantha is a large tree native to eastern Australia, its range extending from New South Wales to central Queensland. The timber is comparatively light (average dry weight 55 lb. per cu. ft.) and it makes excellent fuelwood. It is not durable in contact with the soil and does not stand weathering well; it is suitable for general building purposes only where not unduly exposed. The oil is of the type used by the mining industry in the separation of mineral sulphides from ores by a flotation process.

12.29. Monocotyledons

12.29 : 12.11.23 ; 42 : 45.3. SAHI, S. P. **Some observations on the growth and development of *Dendrocalamus strictus*.** *Indian For.* 69, 1943 (55–66 + plates).

An account of the structure and growth of the rhizome and culm of *Dendrocalamus strictus*, together with notes on the causes of culm malformation. This may be the result of physical obstruction, insect attack, physical injury, or exposure, during the period of active growth. The growing culm is, however, very hardy to adverse conditions as the tip is well protected by sheaths and the topmost internode is securely embedded several inches below the visible tip of the culm. If the culm is beheaded, growth usually continues until the last upper internode left intact has reached its full development.

12.29 : 21.0 (76.3). WILSON, C., and WILSON, M. **Exotic Bamboos.** *Home Gard.* (*New Orleans, La.*) 2, 1942 (210–11). U.S.D.A. Bibliog. (Plant Science) 1 (D–206).

Bambusa ventricosa, *Phyllostachys nigra* var. *punctata*, *P. bambusoides*, *P. nigra nenonis* are among those that have proved hardy and adaptable.

13.1. *General Zoology*

13.11 : 13.2 : 31.43 : 12.25. BECKER, G. Zur Sinnesphysiologie des Hausbockkäfers. **[On the physiology of the senses in *Hylotrupes bajulus*.]** *Naturwissenschaften* 30 (17/18), 1942 (253–6). [G.] R.A.E. 31A (121).

In laboratory experiments, 15 essential oils were tested by a technique that is described, but only α-pinene, β-pinene and (to a less degree) one or two others attracted ovipositing females. The placing of these terpenes, or of an oil containing them, such as turpentine, on a wood block always led to oviposition. It is suggested that these substances might be used to induce the females to oviposit in a given place so that infestation of other timber might be prevented.

13.14 : 13.2. WALLACE, P. P., and BEARD, R. L. **Larval characteristics of certain Elm bark infesting Coleoptera.** *Canad. Ent.* 74, 1942 (86–7). [Connecticut Agricultural Exp. Sta., New Haven, Conn.] I.I.E.

Larval characteristics found usable in the field for the rapid identification of *Scolytus multistriatus* Marsh, *Hylurgopinus rufipes* Eichh. and *Magdalis* spp., with a note also on the larvae of *Scolytus sulcatus* Lec. It is difficult if not impossible to distinguish between *Magdalis armicollis* Say and *M. barbita* Say in the field.

13.2. *Special [Systematic] Zoology*

13.2 (54) : 13.15 : 45.3. BEESON, C. F. C. **The ecology and control of the forest insects of India and the neighbouring countries.** Published by the author and printed at the Vasant Press, Dehra Dun. 1941. pp. ii + 1007.

Opening with a short survey of the history of forest entomology in India and the adjoining countries, and with some general notes on the methods of feeding of insects, life cycles and connected matters, the bulk (773 pp.) of the book is devoted to a systematic record of available information on the ecology of insects related to Indian forests. In all 4,300 species are mentioned 'including at least one representative of every type of locality-plant-insect combination found in Indian forests . . . and every species which has been the subject . . . of an expression of interest by a Forest Officer of the Indian Empire'. The information is arranged alphabetically by orders and then families of insects, each species being dealt with separately, again in alphabetical sequence. Reference is facilitated by the printing of index heads for order and family on every page, the general index being used for tracing information relating to individual tree hosts. The author gives for each species a very brief description (length of insect only for the less important), a list of recorded hosts, an account of what is known of the life history (in full detail for the important species), and notes on the nature of the damage done and its economic importance. The text is profusely illustrated by 200 figures, mostly published before, of adult and immature stages of the insects (including 55 of beetle larvae), and of affected host plants or timber, emergence curves, etc. Forty pages are devoted to Scolytidae and thirty to termites, and the fullest account (11 pp.) appears to be that for the Pyralid moth, *Hapalia machaeralis*, the Teak skeletoniser; the literature is quoted at the end of the account of each species.

The second part deals with control, the view taken being that epidemiology must be the central problem of research and that the most effective measure is usually silvicultural control in the direction of 'back to the best in nature', since the natural vegetation climax is relatively free from destructive insect attack. Seven types of control are distinguished, 3 natural and 4 artificial, viz., climatic, nutritional, biotic, and silvicultural, biological, mechanical and chemical, and each is discussed in turn in general terms, but with particular reference to Indian species and conditions. The importance of correct diagnosis of the causes of dying-off of trees is stressed with a note of warning concerning the predisposition to attack of trees or crops that are over or under nourished through being unsuited to the site in which they grow. The last part of the book deals with specific control measures for each type of insect, arranged alphabetically as in Part I.

H. G. C.

13.2 (42.1–8) : 09.2. BLAIR, K. G. **Scolytidae (Col.)**

from the Wealden formation. *Ent. Mon. Mag.* 79, 1943 (59–60).

Characteristic figures of Scolytid burrowings observed in a piece of (probably coniferous) fossil wood from the Wealden deposits of Sussex afford evidence of the existence of the Scolytidae as a family at this early period.

13.2 (42.1–8) : 12.21. TOZER, D. **Notes on the occurrence of *Platyrrhinus resinosus* Scop. (Col., Anthribidae) in the midlands.** *Ent. Mon. Mag.* 79, 1943 (62–3).

The beetle has been found on rotting logs and trees of Ash, and occasionally Beech, which support the fungus *Daldinia concentrica*.

13.2 (54). GARDNER, J. C. M. **On some Indian Cerambycidae.** *Indian For. Rec.* (*n.s.*) *Entomology* 7, 1942 (66–72).

The following new species are described:—*Criocephalus brunneus* and *Dere grahami* from United Provinces; *Ceresium nigromaculatum* and *Clytus balwanti* from Madras; *Chlorophorus acrocarpi* and *C. laharae* from Bengal. Also notes on *Criocephalus tibetanus* Sharp. *From author's summary.*

13.2 (902). HILL, G. F. **Termites (*Isoptera*) from the Australian region.** Council for Scientific & Industrial Research, Commonwealth of Australia. 1942. pp. 479 + plates (mimeo.).

A systematic study of the termites found in Australia, New Guinea, and in islands south of the equator between longitudes 140° E. and 170° W. The author recognizes 4 families, 14 genera, 11 subgenera (inclusive of one new subgenus and exclusive of a group of *Calotermes* species to which no name or names have been given), 193 species and 8 subspecies. The four recognized families of termites are Mastotermitidae, Calotermitidae, Rhinotermitidae and Termitidae. The distinguishing characters of each family are outlined, and all species with synonyms are listed as are the described castes. Thirty-two of the species are described as new, 13 of them in the winged adult and soldier castes, 5 in the winged adult caste only, and 14 in the soldier caste only. A key to the genera based on the characters of the soldier caste is followed by detailed descriptions of the species including, where available, information on winged adult, soldier and worker, measurements, distribution, and biology, as well as on synonymy. The bibliography gives 25 references. Twenty-four plates, mainly of termite nests, are appended.

2. SILVICULTURE

2 (54) : 07.2. **Silvicultural research in India.** *Sci. & Cult.* 6, 1940–41 (274–6). [Forest Research Institute, Dehra Dun.] L.S.

This article discusses briefly some of the problems of Indian forestry and the contribution that silvicultural research is making towards their solution.

21. SILVICULTURAL CHARACTERS OF TREE SPECIES

21.1. *Light and Temperature Requirements*

21.11 : 12.11.23 : 11.25. GUSTAFSON, F. G. **Influence of light upon tree growth.** *J. For.* 41, 1943 (212–3). [University of Michigan.]

Twenty-five 2–2 transplants of White Spruce (*Picea glauca*) and Red Pine (*Pinus resinosa*) were planted in 1932 in the same soil and under different light intensities including full sunlight and approximately $\frac{3}{4}$, $\frac{1}{2}$ and $\frac{1}{4}$ of full sunlight. Results obtained over the period 1932–40 indicate that light is an important factor in the growth of White Spruce on a good site and having ample water supplies; it appears that a light intensity of $\frac{3}{4}$ of full sunlight produces the best growth in young trees of this species. The Pines did not do well under any conditions, but results indicate that both diameter and height growth increase with light intensity up to full sunlight.

21.2. *Moisture Requirements. Water régime*

21.2–3 : 23.24. MINCKLER, L. S. **Forest plantation success and soil-site characteristics on old fields in the Great Appalachian Valley.** *Proc. Soil Sci. Soc. Amer. 1941* 6, 1942 (396–8). [Appalachian Forest Experiment Station.] H.S.B.

About 700 experimental plantings were made on dolomite, limestone and shale soil types and with different aspects and topographic positions. Soil and site characteristics have a marked influence on the growth and survival of various species, but sites eroded nearly to the B horizon give almost as good growth as average and good sites, while sites long out of cultivation, with sheet erosion arrested and a good deposit of litter, give better results than soil conditions and topography seem to indicate. A permeable and well developed B horizon largely compensates for shallow top soil, but a stiff B horizon retards growth. The dominant factor is the water regime of the soil-plant relationship.

21.3. *Soil Requirements*

21.3 : 11.49 : 11.41.3 : 11.42,3. RUSCHMANN, G., and POZDENA, L. **Beziehungen zwischen physikalischer und biologischer Bodenerkrankung. [Relationships between physical and biological soil factors that are adverse to plant growth.]** *Zbl. Bakt.* 105, 1942 (213–33). [G.g.] [Institut für Bodenkunde u. Pflanzenernährung, Landsberg/Warthe.] H.S.B.

Two fundamentally different soil profiles were compared with regard to their physical, chemical and biological properties, one from a bog and the other from a highly podsolized forest floor. In both cases the soil was unsuitable for normal plant growth. In the soil of the bog, in spite of a high absolute water content, there existed a state approaching physiological drought accompanied by severe disturbances in the circulation of water and air; while in the woodland soil the limiting factor was a strongly acid reaction. The character of each soil type was reflected in the number and composition of the microflora, which in both cases were less numerous than in healthy soils, and which, apart from mould fungi, were found in greater numbers in the soil of the bog than in that of the woodland. Data are given for the various horizons of each type of soil.

21.3 : 12.14.3 : 21.64 : 12.25 : 12.26–8. CONNECTICUT. **Connecticut Agricultural Experiment Station. Annual report for the year ending October 31, 1941.** *Bull. Conn. agric. Exp. Sta.* No. 452, 1942. pp. 35.

From an investigation of the root systems of five

tree species that had grown for seven years on two distinct soils, a loamy sand (Merrimac) and a fine sandy loam (Charlton), it was found that roots penetrated deeper and had a wider spread in the first soil, but that the number of small feeding roots per cu. ft. of top soil was greater in the second soil, where survival and growth were generally better. Nitrogen, organic matter and fine clay content were higher in zones of high root concentration than where roots were few or absent. White Pine had the largest number of roots, the other species decreasing in the order of Red Pine, Norway Spruce, White Ash and Red Oak (p. 24).

21.3 : 12.25. BRITISH COLUMBIA. **Report of the Forest Branch for the year ended December 31st, 1942.** King's Printer, Victoria, B.C. 1943. pp. 69 + plates.

Experiments with Douglas Fir and Western Hemlock indicate that the nutritional requirements of these species are relatively low, that nitrogen and phosphate are the elements most likely to be limiting to the growth of the seedlings, and that growth of these species should be improved by soil treatments, particularly those tending to improve the physical condition of the soil (p. 17).

21.6. *Behaviour in the Stand*

21.6 : 12.25 : 60.3. BRADSHAW, K. E., and REVEAL, J. L. **Tree classifications for *Pinus monophylla* and *Juniperus utahensis*.** *J. For.* 41, 1943 (100–4). [Soil Conservation Service, Berkeley, Calif.]

Four maturity classes (reproduction, immature, mature and overmature) for Singleleaf Piñon (*Pinus monophylla*) and Utah Juniper (*Juniperus utahensis*) are presented and illustrated with the object of providing a uniform basis for describing trees and stands of these species. The work is based on observations made in southeastern and central-western Nevada. It is believed that with certain adjustments these classifications will apply throughout the range of the two species except on lowest quality sites, for which additional information is given on position, tree form, tree quality, density, associated vegetation and soil.

21.62 : 12.26–8 : 34.26. HAINES, W. B. **A method for foliage comparisons in field experiments with *Hevea*.** *Emp. J. exp. Agric.* 10, 1942 (117–24 + plate). A.P.B.

Foliage values in stands of rubber-trees are assessed by means of a simple viewing device of mirror and grid, with a convention for awarding marks. In comparison with other direct criteria it is claimed that the method gives more speedy indications of tree reactions than anything hitherto generally used. *Author's summary.*

21.64 : 12.25 : 43 : 44.3. CHAPMAN, H. H. **A 27-year record of annual burning versus protection of Longleaf-Pine reproduction.** *J. For.* 41, 1943 (71–2). [Yale School of Forestry.]

Annual burning of a Longleaf Pine slot from two years after seedling establishment (in 1913) resulted in a 5-year set-back in height and volume growth as compared with unburned conditions. At present, however, diameter growth is greater on the burned area than on the unburned area where density of stocking has caused stagnation. A combination of brown-spot disease and shade from wolf trees of Shortleaf and Loblolly Pine caused 100 per cent. mortality by 1942 of Longleaf Pine established in 1919 and subsequently protected against hogs and burning. Where wolf trees were absent or removed the Longleaf Pine managed to survive the brown-leaf disease to the extent of about 500 trees per acre and their development is about 10 years behind that of uninfected trees.

21.64 : 12.25 (73) : 22.89. HOUGH, A. F. **Norway Spruce for pulpwood.** *J. For.* 41, 1943 (66–8). [Allegheny Forest Exp. Sta.]

Evidence from established plantations of Norway Spruce in the eastern and northeastern United States indicates that this species should be planted only under favourable site conditions. Plantations of this species were established in 1909 on four sites, similar in soil, general climate and topography, consisting of (1) open-pastured bottomland, (2) old field, (3) cleared log landing, and (4) recently cut-over Beech/Maple virgin forest. While conditions favoured the production of Spruce on the first three sites, volunteer hardwood reproduction and samplings soon overtopped the planted Spruce on the cut-over hardwood site (4), and by 1940 the percentage basal area on this plantation was distributed as follows:—Pin Cherry 8, Sugar Maple 47, Norway Spruce 30, Beech 7, and Black Cherry 6. Weeding would have to be done at a relatively early age to make this site suitable for Norway Spruce production.

21.64 : 22.89 : 12.25 : 4. MUNGER, T. T. **Vital statistics for some Douglas-Fir plantations.** *J. For.* 41, 1943 (53–6). [Pacific Northwest Forest and Range Exp. Sta., Portland, Ore.]

A 26-year record of 12 plantations in the Douglas Fir region shows that planted trees continue to die in considerable numbers from a variety of causes long after the period of establishment and that there is also considerable mutilation of surviving trees. These facts are of particular significance in that the original stocking of such plantations is usually only sufficient to ensure quick closing of the canopy and wholesome competition. Causes of mortality after the establishment period are listed as fire, mountain beaver, rabbits, deer, bear, snowbreak, winter kill, falling snags and bark, and competing vegetation.

21.8. *Phenology*

21.8 : 56.01 : 12.25 : 21.12. MORK, E. Om sambandet mellom temperatur og vekst. Undersökelser av de daglige variasjoner i granens höidetilvekst. **[On the correlation between temperature and growth. Investigations on the daily variations in the height growth of Norway Spruce.]** *Medd. norske Skogforsøksv.* No. 27 [Vol. 8, No. 1], 1941 (1–89). [Nor.g.] N.D.A.

The author reviews briefly the work undertaken in Scandinavia and Central Europe on the correlation between growth and temperature. It has been found that daily variations in diameter growth are difficult to measure accurately as the varying moisture and temperature of the stem and the instability of the bark give rise to a fairly high percentage of error. Height-growth measurements are less affected by these factors owing to the relatively big daily growth of the leading shoot (up to 1·2 in. per 24 hours).

Results are given of a study of the daily variations in height growth of Norway Spruce. Measurements of trees at Hirkjölen, 3,100 ft. above sea-level, indicate that temperature is the significant factor affecting height growth in mountain regions. Growth is negligible between 6 a.m. and noon, it begins about noon and increases in intensity until it reaches a maximum between 8 and 10 p.m. Thus the period of growth is six hours behind the effective temperature, this being

the time needed for assimilation, the transportation of carbohydrates to the shoot and subsequent cell division.

Trees in lowland areas showed a similar variation in growth except that it had practically ceased by 8 p.m., due probably to lack of available moisture resulting in the closure of stomata and so preventing the passage of CO_2 from the free air to the chlorophyll. Growth per cent. per day proved to be greater in the mountains than in the lowlands where lack of water became the limiting factor as temperature increased.

Investigations in the mountain region showed that growth increases evenly with temperature up to 13° C., according to the formula $y = 0{\cdot}183t - 0{\cdot}479$. Between 13° and 24° C., $y = 3{\cdot}85 - 0{\cdot}475t + 0{\cdot}025t^2$. [$y$ = growth per cent. and t = temperature in degrees Centigrade].

The average summer temperature is not considered by the author to be a good measure of the growth possibilities (growth climate) of a locality. For example, the summer temperature at the inland station of Alvdal was 50·4 per cent. more effective so far as growth is concerned than that at the coastal station of Nordöyan, although the average summer temperatures of these two places are the same. The reason is that Alvdal has more warm, sunny days that are valuable for growth, although there are wider variations in temperature than at Nordöyan.

The purpose of this work has been to determine factors or weights for use in calculating the effectiveness of favourable temperature on growth; these are referred to as 'growth units'. A table gives the growth units for each degree of temperature from 4° to 28° C. The 'warmth effect' obtained on a day with an average temperature of 8° is shown as one unit, for 12° as 1·75 units, and for 17° as 3·0 units; one day with an average temperature of 24° is as effective as 7 days of 8° C..

The results of this work can be used in calculating the altitudinal limits for seed ripening under different types of climate and also in comparing coastal and inland climates. FINN FROST.

22. SILVICULTURAL SYSTEMS. FORMS OF STAND

22.11 (481) : 12.25 : 22.14.1 : 21.31 : 23.24.2. COLLETT, O. Kulturskogbruk nordenfjells. [**Silviculture in northern districts of Norway.**] *Tidsskr. Skogbr.* 50, 1942 (291–7). [Nor.] N.D.A.

An account is given of experience over a period of 40 years in Spruce and Pine forests where clear-felling with planting has been carried out on a fairly large scale. The results indicate the advantages of this method as compared with the selection system under the conditions of relatively humid and cold forest soils such as are found in these districts. The article includes instructions on planting. F. F.

22.14.1 (494) : 12.25 : 12.26–8 : 56.04 : 12.14.6 : 21.61 : 31.2. BURGER, H. Holz, Blattmenge und Zuwachs. VI. Mitteilung. Ein Plenterwald mittlerer Standortsgüte. Der bernische Staatswald Toppwald in Emmental. [**Wood, quantity of foliage and increment. VI. A selection forest of medium site quality. The Bernese state forest of Toppwald in the Emmental.**] *Mitt. Schweiz. Anst. forstl. Versuchsw.* 22, 1942 (377–445). [G.g.f.]

In the investigation described, data were obtained on crown structure, quantity of foliage, increment, and wood properties analagous to those from previously investigated even-aged stands [cf. investigations on stands of Beech, Norway Spruce, and Scots Pine summarized in *For. Abstr.* 3 (175) and 4 (135–6). The selection forest investigated was composed of Silver Fir, Norway Spruce, and Beech, and, broadly speaking, the data obtained did not differ substantially from corresponding figures for even-aged stands. However, it was found *inter alia* that the weight per ha. of brushwood was substantially higher in the selection forest than in even-aged Norway Spruce and Silver Fir stands and that the foliage was distributed over a larger crown volume, though the fresh weight and the aggregate surface of the foliage was not significantly different. The annual "Derbholz" increment of the selection forest was 10 cu. m. per ha., of which 93 per cent. was produced by trees 15 cm. diameter and larger, 66 per cent. by those 37 cm. diameter and larger, and 36 per cent. by those 52 cm. diameter and larger. Thus, despite the fairly mediocre quality of the site, most of the increment was put on by the more valuable large-size timber.

22.88.2 : 12.19.2 : 12.26–8 : 12.19.4. OOSTING, H. J., and REED, J. F. **The establishment of a White Birch community on cutover pulpwood land in northwestern Maine.** *Bull. Torrey bot. Cl.* 69, 1942 (647–60). [Duke University, Durham, N.C.] O.B.D.

This study shows that during the 10-year period following the clear-cutting of a mixed Spruce/hardwood forest, a mixed stand, dominated by White Birch and including species typical of the mixed Spruce/hardwood forest of the northeastern United States, became established. Phytosociological analysis indicated an essential similarity between the young stand and a 54- to 60-year-old White Birch/mixed forest community, which is the characteristic forest on many of the lower slopes in northwestern Maine. While not all mixed Spruce/hardwood forests return, after clearing, to a forest in which White Birch is dominant, it was found that White Birch, Pin Cherry, Yellow Birch, and a limited amount of Aspen seem to be most important in establishing the first canopy on certain clear-cut sites. Abundant Balsam Fir, Red Spruce, and White Birch reproduction constitute the secondary layer of the young stand when ten years of age.

Where White Birch does gain ascendancy immediately after cutting, it remains as a dominant in the stand for at least 60 years. Most of the White Birch in the region is cut by the time it reaches 60–70 years of age, and it appears that when once this species is eliminated from the community, either through senility or by selective logging, the subsequent forest remaining and persisting would be a typical mixed Spruce/hardwood stand which would include Red Spruce, Red and Sugar Maples, and Yellow Birch as its major components. *From authors' summary.*

23. FORMATION OF STANDS

23.1. *Natural Regeneration*

23.1 : 12.25 : 23.13. UNITED STATES. **Seventh annual report of the Rocky Mountain Forest and Range Experiment Station, 1942.** Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colorado. [1943?] pp. 36 + iii + plates.

In a study of conditions affecting the regeneration of Engelmann Spruce, made on a single clear-cut area in the pure Spruce/Fir type, it was found that:—(1) the

dead material on the ground before logging together with the logging slash seriously impedes regeneration for many years, (2) the seed of Engelmann Spruce germinates more readily on a mineral than on an organic seedbed, (3) rodents are at least partly responsible for lack of reproduction in the Engelmann Spruce type, and (4) burning of slash and scarification of the forest floor will encourage reproduction (p. 28).

23.1 (78.7–8) : 12.25 : 12.19.4 : 21.64. ŞTAHELIN, R. **Factors influencing the natural restocking of high altitude burns by coniferous trees in the central Rocky Mountains.** *Ecology* 24, 1943 (19–30). [Rocky Mountain Forest and Range Exp. Sta.]

The survey included eight areas ranging in elevation from 9,000 to 11,000 ft. representative of approximately three million acres of burned-over lands of the Engelmann Spruce/Alpine Fir type in Colorado and southern Wyoming. The last major fire occurred 50 to 70 years prior to the survey.

The subclimax prevailing in the secondary succession was found to have a strong influence on the rate of the recovery of the coniferous cover. Where Lodgepole Pine (*Pinus contorta* var. *latifolia* Engelm.) was represented in the original stand, a sufficient number of seeds of this species was able to escape destruction during forest fires to form eventually a stand of seed trees which will re-establish a Lodgepole-Pine cover within 50 to 100 years. Outside the distribution of Lodgepole Pine, Aspen (*Populus tremuloides* var. *aurea* (Tides.) Daniels) constitutes the typical fire subclimax at lower elevations in the sub-alpine forest zone. This species creates a favourable environment for the establishment of Spruce and Fir seedlings, but the rate of restocking depends on the presence of seed trees. Above the areas of Aspen and Lodgepole Pine, sub-alpine grassland species build up a dense turf which constitutes an effective barrier to the establishment of coniferous seedlings. The occurrence of dry park grassland is restricted mainly to dry sites at lower elevations.

The general conditions on burned-over areas are influenced by many interrelated factors, the most important of those affecting the rate of coniferous restocking being abundance of seed trees, exposure, cover and soil type. In general, it can be expected that areas supporting more than ten well-scattered seed trees per acre will revert to a coniferous stand within 50 years of a forest fire except when grass is dense. *From author's summary.*

23.11.1 : 12.25 : 23.13. ZEHNGRAFF, P. J. **Jack Pine regeneration following clear cutting on the Chippewa National Forest.** *J. For.* 41, 1943 (122–5). [Lake States Forest Exp. Sta.]

Experience on the Chippewa National Forest has proved that satisfactory Jack Pine reproduction following clear-cutting can be obtained with the help of ground scarification. In order to obtain satisfactory stocking sixty per cent. or more of the surface area of mineral soil must be exposed. Logging should be done during the autumn and winter, the slash being piled progressively to prevent cone-opening, and scarification followed by slash disposal (even distribution of cones essential) should be done in early spring or late fall after all possibility of fall germination has passed. Best results were obtained in 70- to 80-year-old well-stocked stands.

23.2. *Artificial Regeneration*

23.2 : 12.26–8 : 12.19 : 23.23.12 : 23.61. GULWADI, S. V. **Sandalwood regeneration in Sambrani Range in the Kanara Northern Division.** *Indian For.* 69, 1943 (67–74).

Notes are included on the distribution and natural habitat of *Santalum album*. Associated species for which it shows a preference are listed. This species is dependent less on soil and rainfall conditions for propagation than on the presence of primary and secondary host plants, the protection of the seed and seedling from animals and fire, and the presence of overhead light. Various methods of propagation are discussed, the most successful being the sowing of Sandal seeds with seeds of *Calotropis gigantia* and *Cassia siamea*. *Calotropis* serves as an excellent primary host, enabling the Sandal to grow vigorously in early life, while later on the profuse growth of *Cassia* gives it scope to form permanent haustorial connexions. *Calotropis* dies out after the second year when *Cassia siamea* has formed a light canopy and the saplings of Sandal are well established. No weeding is required in the second year, but it is sometimes necessary to lop off some of the branches of *Cassia* as Sandal prefers overhead light, although it is tolerant of side shade.

23.21. Choice of Species

23.21 (77.8) : 12.25 : 23.24 : 23.6 : 44.3 : 45.3. ANDERSON, E., BEILMANN, A. P., and CLARK, R. B. **Evergreens for St. Louis.** *Bull. Mo. bot. Gdn.* 29, 1941 (223–48). L.S.

A catalogue of coniferous evergreens which may be recommended tentatively for growth in St. Louis. Notes are included on the selection, planting and care of young trees, and on pests and diseases.

23.22. Preparatory Work. Auxiliary Measures

23.22.1 : 56.01 : 12.25 : 12.26–8 : 24.1. LIMING, F. G., and SEIZERT, B. F. **Relative height growth of planted Shortleaf Pine and cut-back and uncut hardwood reproduction after release.** *J. For.* 41, 1943 (214–6). [Central States Forest Exp. Sta. and Clark National Forest.]

On the basis of the present study it is concluded that where Shortleaf Pine (*Pinus echinata*) is to be planted in inferior Oak/Hickory stands and the plantation is to be released by removal of the overstorey, it will not be necessary to cut the hardwood reproduction if natural openings can be found in the reproduction for the Pine seedlings, as, with a quicker and greater response to release, the Pine will soon dominate the hardwoods. Where Pine seedlings have to be planted under hardwood reproduction the latter should be removed, and, because of the high growth rate of new sprouts from reproduction cut back at the time of overhead release, later cuttings may be necessary to prevent them overtopping the Pine.

23.23. Sowings

23.23.1. *Seed Procurement, Treatment, and Testing*

23.23.11 : 12.26–8. GUARD, A. T. **Seed production in the Tulip tree.** *Abstr.* in *Proc. Indiana Acad. Sci. 1941* 51, 1942 (75). [Purdue University.] A.P.B.

In order to study the effect of cross pollination on the production of good seed in the Tulip tree, some flowers were fertilized with pollen from a tree about 20 miles

distant. The percentage of good seed resulting from the cross-pollinated flowers was compared with that of other flowers on the same tree.

23.23.11–2 : 12.26–8. KAMALAPUR, V. R. **Note on the seed of *Hardwickia binata*.** *Indian For.* 68, 1942 (531).

Trees of *Hardwickia binata* introduced into the Poona and Satara Divisions from Khandesh some thirty years ago failed to fruit until 1939. As soon as the pods ripened (at the end of March) the seeds were eaten by birds; to prevent this immediate collection is necessary.

23.23.19 : 12.25 : 11.15 : 11.11. ALLEN, C. S. **Light and temperature as factors in the germination of the seed of Douglas Fir (*Pseudotsuga taxifolia* (Lamb.) Britt.).** *For. Chron.* 17, 1941 (99–109). [British Columbia Forest Service.]

It is concluded that temperature is likely to be a limiting factor with respect to the germination of untreated Douglas Fir seed; it may be limiting under natural conditions where seed has remained dry-stored in the cones on the tree. Light also may be a limiting factor, but quantitatively it is much less important than temperature. Within the limits of the data available it appears that neither light nor temperature is likely to be a limiting factor in the germination of stratified seed or of seed that has overwintered on the ground; Douglas Fir seed should therefore be stratified before testing.

23.23.19 : 12.25 : 12.26–8. HAMILTON, S. W. **Ratios of clean and rough seed.** *J. For.* 41, 1943 (63–4). [Tennessee Valley Authority.]

Figures are given to show the amount of rough seed (including cones, pods or fruits, and unavoidable impurities) collected for use by the T.V.A. from 1935 to 1940 and the quantities of clean seed derived therefrom for the species Shortleaf Pine, Loblolly Pine, White Pine, Virginia Pine, Black Locust and Yellow Poplar.

23.23.19 : 12.26–8. **Germination of seeds: field germination of various hardwoods.** *Amer. Nurseryman* 77 (6), 1943 (32).

The conditions found to be most favourable for the germination of seeds of the following hardwood species are indicated: Red Oak (*Quercus rubra*), European Oak (*Quercus robur*), Shagbark Hickory (*Carya ovata*), Bitternut Hickory (*Carya cordiformis*), Black Walnut (*Juglans nigra*), Butternut (*Juglans cinerea*), *Catalpa speciosa*, and European Mountain Ash (*Sorbus aucuparia*).

23.23.19 : 12.26–8 : 21.9 : 12.14.7. DENT, T. V. **Some records of extreme longevity of seeds of Indian forest plants.** *Indian For.* 68, 1942 (617–31 + plates). [Forest Research Institute, Dehra Dun.]

In germination tests carried out with 64 samples (52 species) of seed from exhibition cases in the museums of the Forest Research Institute at Dehra Dun the oldest sample which germinated was a single seed of *Caesalpina digyna* aged 41 years. Other species of Leguminosae also showed remarkable longevity, successful germination having been obtained with seed aged between 23 and 31 years for 8 species (*Acacia farnesiana*, *Cassia fistula*, *Albizzia lebbek*, *A. odoratissima*, *Dichrostachys cinerea*, *Acacia dealbata*, *A. decurrens* and *Leucaena glauca*). Of four species of Malvaceae tested, three proved germinable—*Hibiscus macrophyllus* (24 yrs.), *Ochroma lagopus* (24 yrs.) and *Abutilon indicum* (17 yrs.).

23.23.19 : 12.26–8. PESCOTT, E. E. **Germination of the seed of Mallee Eucalypts.** *Vict. Nat.* 58, 1941 (8). O.R.S.

A brief review of evidence refuting the claim that the seeds of Mallee Eucalypts are not germinable. In one case it is shown that numerous seedlings were obtained from seed of *Eucalyptus dumosa*, *E. leptophylla* and *E. oleosa*, while a few plants of *E. gracilis*, *E. incrassata*, *E. polybractea*, *E. uncinata*, and *E. calycogona* were also raised.

23.23.19 : 12.26–8. ZIMMER, W. J. **Some notes on the germination of Mallee Eucalypts.** *Vict. Nat.* 58, 1941 (61–2). O.R.S.

Supporting evidence is given of the capacity of the seed of Mallee Eucalypts to germinate [cf. preceding abstract]. Thousands of seedlings of *Eucalyptus incrassata*, *E. angulosa*, *E. dumosa*, *E. gracilis*, *E. oleosa*, and *E. vividis* have been successfully raised from seed at the Forests Commission tree nursery, Merbein. Some data are also given on the effect of intermittent supplies of moisture on the viability of the seed of *E. oleosa*, *E. rostrata* and *E. bicolor*.

23.23.3. *Methods of Sowing*

23.23.3 : 12.25. HEIT, C. E. **Sow coniferous tree seeds this fall: laboratory tests indicate which species will give best results.** *Quart. Bull. N.Y. agric. Exp. Sta.* 7 (4), 1941 (2, 10).

For conditions similar to those in New York State fall sowing is recommended in preference to spring sowing for those species of conifers whose seeds show a dormant nature. Advantages of fall sowing include increased field germination, increased vigour of seedlings and reduction in weeds.

23.24. Formation of Stands by Planting

23.24 : 12.25 : 12.26–8 : 21.64. BAROJAS, S. Reforestación con pinaceas. **[Reforestation with Pines.]** *Bol. Dep. For. Caza Pesca, México* 3 (1); 1942 (8–12). [Span.] Biol. Abstr. 17 (2770).

One-year-old seedlings of *Pinus patula* and *P. montezumae*, planted on low hills near Tlalpan, D.F., have nearly all survived and grown well except where the soil was shallow and dry. On another, drier site with poor soil, a preliminary plantation of Eucalypts and Acacias was made. These trees did fairly well.

23.24 : 23.27. ELLIOT, N. R. **How to plant shade trees.** *Circ. Ky. Coll. Agric. Ext. Serv.* No. 371, 1941. pp. 8.

Practical advice on the transplanting of shade trees in Kentucky and on their care during the first few years after establishment.

23.24.2. *Methods of Planting*

23.24.2 (54.5) : 12.26–8 : 23.26 : 23.6. MOHAN, N. P. **Stump planting.** The Rural Reconstruction Branch, Co-operative Department, Lahore. 1941. pp. 20 + plates.

The advantages of stump planting are outlined, and practical advice is given on nursery practice in the rearing of Shisham (*Dalbergia sissoo*) and Mulberry (*Morus alba*) from stumps. The success of stump propagation depends on the ability of a tree to develop an adequate root system in a short time. A list of the principal Punjab trees suitable for stump planting is included.

23.26. Plant Rearing. Nursery Practice

23.26 : 12.26–8 (54.5) : 23.3 : 23.21 : 23.6. **Nursery practice and afforestation in irrigated plantations of the Punjab.** *Punjab For. Rec.* 1 (10), 1942. pp. 10.

Recommendations are made for the raising of Shisham (*Dalbergia sissoo*) and Mulberry (*Morus alba*) in nurseries. Data are included on factors such as choice of site, layout, methods of sowing, irrigation, weeding, and the extraction, making and storage of 'stumps' (root and shoot cuttings). Information is also given on desirable practice in the afforestation of new areas with Shisham and Mulberry or Bakain (*Melia azedarach*), by direct sowings, stump planting and entire transplanting.

To supplement Shisham in irrigated plantations other species are usually introduced. These may be (1) planted at the time of the original stocking in areas unsuitable for Shisham (e.g. *Prosopis* and *Tamarix articulata*), (2) used to fill up blanks in the Shisham crop (e.g. Bakain, *Celtis*, *Acacia farnesiana*), (3) introduced as an understorey after the first thinnings (e.g. *Morus alba* and *Celtis*), or (4) used as hedge plants, or as shelterbelt or avenue trees (e.g. *Acacia modesta*, *Rhus lancea* and *Eucalyptus*). Notes are given on the cultivation of these subsidiary species.

23.26.1 : 23.24.1. PINNEY, J. J. **Can ship evergreens bare root.** *Amer. Nurseryman* 77 (1), 1943 (7).

Less labour, skill and shipping space are required when evergreens are shipped without a ball of soil than when they are balled and burlapped. Provided the roots are not permitted to dry out, bare root evergreens, especially if packed in wet sphagnum moss, usually grow successfully when transplanted. Suggestions are given for the digging and packing of such trees.

23.27. Arboriculture

23.27 (78.9) : 12.25 : 12.26–8. ENZIE, J. V. **Ornamental trees and shrubs for New Mexico.** *Bull. N. Mex. agric. Exp. Sta.* No. 284, 1941. pp. 48.

A report giving the names and brief descriptions of some of the more common trees and shrubs which have been grown successfully in experimental plots in New Mexico.

23.3. *Afforestation*

23.3 (410) : 12.19 : 64. ROBINSON, SIR R. **Some ecological aspects of afforestation and forestry in Great Britain.** *Forestry* 16, 1942 (1–12 + plates).

The author first refers briefly to the work that has been done in Great Britain in correlating site conditions, as indicated by existing surface vegetation, with growth requirements of tree species, and in investigating vegetation types and soils; such fundamental work is of particular significance in the planting of difficult sites.

Two working hypotheses are then presented in an attempt (*a*) to interpret certain phenomena in the growth of mixed plantations in the light of the theory of natural succession, and (*b*) to apply similar considerations to certain aspects of silviculture. The hypotheses are:—

'(1) *Accelerated Succession.* In the natural afforestation of difficult sites some species are pioneers and some are successors. It is not feasible by artificial means to bring in the successors in advance of the pioneers. It is possible, however, to accelerate the natural succession by mixed planting of pioneers and successors and by appropriate thinning treatment to complete the succession in the course of a single rotation. A successor on one site may be a pioneer on another'. Experience in planting the two extreme types of difficult sites in Great Britain—the acid soils of the older rocks (bearing *Calluna*) and the lime soils of the chalk—has demonstrated the beneficial effect of a pioneer species when planted simultaneously with successor species or on sites bearing successor species that are in check. Thus on typical *Calluna* sites, where pure crops of Spruce and Douglas Fir check almost indefinitely, mixed Pine/Spruce and Pine/Douglas Fir will grow vigorously. The order of effectiveness of the Pines tested for this purpose appears to be Scots and Corsican, Mountain and Contorta. Certain Pines as well as Norway Spruce are effective in bringing on Beech and Ash on chalk soils. In all cases the pioneer species (Pines and Norway Spruce) get away first, a stimulus is passed to the successor species (Douglas Fir, Spruce, Beech and others) which soon pass the pioneers, and, from the evidence, this process continues to the end of the rotation.

'2. *The Silvicultural Stream.* In the silvicultural treatment of woodlands the most effective methods are those which proceed in the direction of a natural succession of vegetation'. As the natural vegetation (e.g. heather), develops from one stage to another there is a gradual improvement in site quality (physical and chemical soil conditions) that is more favourable to the establishment of trees. On difficult sites that have not reached such a stage in development, an improvement of conditions may be brought about by use of the proper technique at the time of planting. Thus the successful establishment of Pine on particularly degraded soils is made possible by deep ploughing and the use of planting stock that is properly inoculated with mycorrhiza. Spruce may be established on typical heather sites following deep ploughing and planting in mixtures with Pine.

It is pointed out that the closing of the canopy of young plantations has an important favourable effect on their ecology and development, and it is suggested that with a better knowledge of the actual processes taking place at that time it might be possible to devise methods for maintaining these processes at their maximum and thus increase the production of timber on a given site.

23.3 : 12.19.2 : 11.44. TIRÉN, L. Till frågen om hyggesmognadens betydelse vid skogsodling. [**On the importance of the ripening of the humus in clear-cut areas prior to reforestation.**] *Medd. Skogsförsöksanst. Stockh.* 32, 1940–41 (195–254). [Sw.e.] E.F.A.

The experiments described in this paper were undertaken to find out whether exposure of the soil for a longer or shorter period prior to the afforestation of a cleared area is likely to produce better results than afforestation immediately after the clearing. From the results of this preliminary investigation it is concluded that in Spruce forest belonging to the *Geranium*, *Dryopteris* or *Vaccinium* types (forest types important in Norrland) and lying at an altitude below 350 m. above sea level, cleared areas intended for afforestation may and should be sown as soon as the mouldering processes have improved the working quality of the soil. In general, this may be estimated to have occurred before the end of the sixth summer for which the soil has been bare, and sometimes before the fourth summer. With

the information at present available the most suitable period must be judged in the field in each individual case.

23.3 (74.7) 12.26–8 : 23.21 : 21.3 : 45.12. **The use of deciduous trees and shrubs in reforestation.** *J. For.* 41, 1943 (94–9). [Society of American Foresters.]

This report of a special committee of the New York Section, Society of American Foresters, is based on field studies by the committee and on information supplied by foresters and biologists in New York and neighbouring states. Comments and recommendations are given for the most important of the tree species on which reports were received, including White Ash (*Fraxinus americana*), Red Oak (*Quercus borealis*), Black Cherry (*Prunus serotina*), Black Locust (*Robinia pseudoacacia*), Sugar Maple (*Acer saccharum*), Tulip Poplar (*Liriodendron tulipifera*), Black Walnut (*Juglans nigra*), Shagbark Hickory (*Carya ovata*), Basswood (*Tilia glabra*), White Oak (*Quercus alba*), American Elm (*Ulmus americana*), Bitternut Hickory (*Carya cordiformis*), Cucumber (*Magnolia acuminata*), hybrid Poplar (× *Populus* sp.), White Birch (*Betula papyrifera*), Chinese Elm (*Ulmus pumila*), Mountain Ash (*Sorbus americana*), and Willow (*Salix* spp.). In addition a list is given of the twelve hardiest shrubs of a total of 36 on which reports were received. General conclusions with respect to the use of hardwoods and shrubs in plantations, and suggestions for future research are based on the information available from the present survey.

23.3 (481) : 23.21 : 12.25 : 97.1 : 96.5 : 97.3. SMITT, A. Mal og veier for skoglkedning av landets snaumarker. **[Ways and means to afforest Norway's unproductive soil.]** *Tidsskr. Skogbr.* 50 ,1942 (345–55). [Nor.] N.D.A.

It is pointed out that while Norway is rich in natural resources these have never been fully used or developed, due to geographical and climatic conditions and also to lack of capital. It is estimated that, apart from the outer coastline, western Norway has 350,000 ha. and northern Norway 100,000 ha. of land that should be planted with Spruce. Most of the areas are privately owned and afforestation would have to be subsidized by the Government. Problems of overgrazing and joint ownership of the land would have to be settled by new legislation and through propaganda.

Norway Spruce (*Picea abies*) is the best species for the coastal regions although it is not indigenous there. Hemlock, Sitka Spruce, Douglas Fir and Larches are recommended. F. F.

23.3 (68.9) : 12.25 : 11.43.1 : 21.0 : 21.2. CLEMENTS, J. B. **The introduction of Pines into Nyasaland.** *Nyasald. agric. quart. J.* 1 (4), 1941 (5–15). A.P.B.

Many unsuccessful attempts were made to grow Pines in Nyasaland before it was discovered that mycorrhiza deficiency of the local soils was the limiting factor. Chil Pine (*Pinus longifolia*) was the only species which survived, and then only when left undisturbed in the nursery. Possibly in this case fungus spores had been introduced with the seed. Inoculation of the soil with mycorrhizae, however, resulted in the success of many species, especially if humus or compost were also added to the soil. Special attention is being given in Nyasaland to species of *Pinus* native to areas of summer rainfall, as Pines from areas of winter or all-the-year-round rainfall do not generally grow well in summer-rainfall areas. The one exception is *Pinus radiata*, which has a higher rate of growth than any other introduced Pine. Brief notes are given on the following exotics under trial:—*Pinus radiata* (syn. *P. insignis*), *P. patula*, *P. echinata*, *P. taeda*, *P. caribaea*, *P. palustris*, *P. longifolia*, *P. teocote*, *P. leiophylla*, *P. macrophylla* (syn. *P. engelmanii*), *P. ponderosa*, *P. khasya* (syn. *P. insularis*), *P. merkusii*, *P. muricata*, *P. sabiniana*, *P. canariensis*, *P: halepensis* and *P. pinaster* (syn. *P. maritima*). A table showing the average heights and ages of the dominant trees in some trial plots is given.

24. TENDING OF STANDS AND TREES

24.2. *Thinnings*

24.2 (481) : 12.25. LANGSAETER, A. Om tynning i enaldret gran- og furuskog. **[Thinning of even-aged Spruce and Pine forests.]** *Medd. norske Skogforsøksv.* No. 27 [Vol. 8, No. 1], 1941 (131–216). [Nor.] N.D.A.

The author presents first a brief historical review of thinning practice in northern and central European countries pointing out the major trends of development. The main part of the paper is concerned with experiments in different systems of thinning that have been undertaken recently in Norway. A bibliography and an explanatory section giving definitions of terms and of systems are included.

The author discusses in detail the effect of thinning on various aspects of timber production, e.g. the increased quality of mature timber as measured by straightness of stem, absence of branches and specific gravity of wood, reference being made to Klem's results (1934) in correlating these factors with increased cellulose content of the tree. Reference is also made to the growing importance of economic factors in the planning of a thinning policy, the object, in general, being to obtain the greatest value increment possible from the forest, represented in high quality timber and raw material for the pulp and paper industry. Consideration is given to the influence of various thinning systems on diameter, height, basal area, and volume increment, on the form and health of the tree, and on the humus under various climatic conditions. Broadly speaking the author favours dense plantations with medium thinnings spaced at regular intervals. His conclusions are supported by recent data from Norway, Denmark, Sweden and Germany. Much new material is used in this survey, e.g. the results of experiments by the Norwegian Forest Research Institute, examined and interpreted by Professor Erling Eide and A. Langsaeter (1941).

24.3. *Opening of the Canopy. Release and Improvement Fellings*

24.3 : 22.11 : 12.26–8 (74) : 60.3. JENSEN, V. S. **Suggestions for the management of northern hardwood stands in the northeast.** *J. For.* 41, 1943 (180–5). [Allegheny Forest Exp. Sta., Philadelphia, Pa.]

Basing his advice on the results of experiments in the establishment and development of a new stand following different degrees of cutting in old-growth northern hardwood type in the northeastern United States, the author recommends (1) complete clear-cutting of areas where mature or overmature trees make up most of the stand; (2) the restriction of clear-cutting to groups of inferior trees in stands containing a large proportion of promising trees; and (3) partial cutting of scattered individuals or small groups of trees in old-growth stands which have previously been opened up to such an

extent that immature even-aged groups have taken over any considerable part of the area. Mowing and weeding of young stands are regarded as of questionable economic value. Thinning may prove worth while, particularly if the products are saleable, and should be undertaken prior to or at about the time when the potentially valuable trees show a decline in growth rate.

24.3 : 22.83.2 : 56. BUELL, J. H. **Results of C.C.C. timber stand improvement on southern Appalachian national forests.** *J. For.* 41, 1943 (105–12). [Appalachian Forest Exp. Sta., Asheville, N.C.]

Stands in national forests in the mountains from West Virginia to Georgia, treated according to the timber-stand-improvement programme of the Civilian Conservation Corps, were examined 5 years after treatment. Information is presented on the effect of the treatment, on the freedom and growth of crop trees, and on the behaviour of felled and girdled trees.

24.31 : 32.29. DYER, R. A. **Eradication of Acacia scrub and trees.** *Fmg. S. Afr.* 17, 1942 (209). L.S.

A note on the use of arsenic pentoxide and other chemicals for the control of unwanted scrub bush.

24.31–6 : 12.25 : 43 : 60.31 : 12.19. WEAVER, H. **Fire as an ecological and silvicultural factor in the Ponderosa-Pine region of the Pacific slope.** With comments by A. A. Brown. *J. For.* 41, 1943 (7–15). [Colville Indian Reservation, Nespelem, Wash.]

Tree-ring studies show that in the past fires have occurred periodically throughout the Ponderosa-Pine region. The author believes that these periodic fires, in combination with Pine-beetle attacks and other agencies, have operated to control the density, age classes, and composition of the Ponderosa-Pine stands, which in general are characterized by the existence of uneven-aged stands made up of even-aged groups in various stages of maturity. The importance of fire as an ecological factor in the Ponderosa-Pine region in the past is emphasized.

The forest protection programme for this region has totally excluded fire from large areas during the past 30 to 40 years. Certain conditions and changes are resulting from this practice of which the following are considered most significant:—(1) Dense even-aged stands of Ponderosa Pine reproduction have developed and over the greater portion of the region growth has stagnated due to overstocking. (2) Dense even-aged stands of the fire-susceptible species, White Fir, Douglas Fir and Incense Cedar, are becoming established under the merchantable Ponderosa Pine over extensive areas, resulting in conditions unfavourable to Pine reproduction. (3) Epidemics of the western Pine beetle, believed to be more severe than those that formerly occurred in the region, are killing billions of bd. ft. of Ponderosa Pine. (4) The fire hazard has increased enormously, and when fires do occur they are exceedingly hot and destructive. The author emphasizes that conditions are becoming increasingly serious over large areas, and urges intensive research on the subject.

24.32 : 12.26–8. KHLAIL, M. A. K. **Advance thinning for Teak plantations.** *Indian For.* 69, 1943 (15–9). [U.P. Forest Service.]

In reply to an article in *Indian For.* 68 (8), 1942 on the application of advance thinning to Teak plantations, it is stated that heavy early thinnings are inadvisable for the following reasons:—(1) Teak responds well even to late thinnings. (2) Opening up a young crop will cause the trees to become branchy. (3) Pruning, although suitable in the case of Mulberry, would prove too expensive in Teak plantations. (4) Weed growth can be kept suppressed only as long as the canopy is closed. (5) The thinnings of the first four years are too small to be merchantable. (6) Heavy early opening of the crop may lead to storm damage among the young shallow-rooted trees thus exposed. (7) Drastic opening of the canopy produces an exposure of site which may result in the conversion of good productive soil into hard, unproductive laterite.

24.36 : 12.25 : 11.62 : 11.14. NIEDERHOF, C. H., and WILM, H. G. **Effect of cutting mature Lodgepole-Pine stands on rainfall interception.** *J. For.* 41, 1943 (57–61). [Rocky Mountain Forest and Range Exp. Sta., Fort Collins, Colo.]

During the summer of 1941 a study was undertaken in Colorado to measure the amount of rainfall reaching the soil in mature stands of Lodgepole Pine (*P. contorta*), and to determine how this quantity is influenced by various intensities of timber cutting. The investigation was made on 20 silvicultural plots of 5 acres each, grouped in four blocks of five plots. Within each block four plots had previously been cut over, leaving one plot in virgin condition and the others with commercial reserve stands of 0, 2,000, 4,000 and 6,000 bd. ft. per acre. In addition, one-half of each plot, with the exception of the virgin plots, was subjected to an improvement cutting.

The study revealed the following facts:—(1) Net rainfall reaching the soil in mature stands of Lodgepole Pine is materially increased by commercial cutting practices. On the commercially clear-cut plots 90·5 per cent. reached the soil, as against 68·3 per cent. on the virgin plots. With the other cutting intensities net rainfall fluctuated round a straight line between these extremes. (2) Timber stand improvement cutting had no significant effect on net rainfall. (3) Net rainfall should increase about 0·10 in. for each foot increase in radius of the canopy opening up to about 18 ft. Thus, treatment can be expressed in terms of average size of canopy openings rather than in bd. ft. per acre. (4) Straight-line relationships exist between net and gross rainfall for all stand conditions. *From authors' summary.*

24.36 : 12.25 : 11.62 : 11.14.4 : 11.14.6. UNITED STATES. **Seventh annual report of the Rocky Mountain Forest and Range Experiment Station, 1942.** Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colorado. [1943?] pp. 36 + iii + plates.

Figures based on two seasons' observations indicate a positive correlation between degree of cutting in mature Lodgepole Pine stands and amount of water stored in the snow under the stand, as follows:

Reserve stand bd. ft./acre	*Water stored in snow (average) in.*
11,890 (uncut)	5·55
6,000	6·90
4,000	7·42
2,000	7·67
0	8·15

As the melt was slower under the denser cover all plots became bare about the same time. Water losses during the summer, due to transpiration and evaporation, amounted to about 1·75 in. of water from the top 18 in. of soil on uncut plots covered with mature Lodgepole Pine and 0·13 in. of water on commercially clear-cut areas (pp. 22–3).

24.36 : 22.14.2 : 12.25 : 42.1 : 45.3 : 13.2. UNITED STATES. **Seventh annual report of the Rocky Mountain Forest and Range Experiment Station, 1942.** Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colorado. [1943?] pp. 36 + iii + plates.

Windfall is the principal cause of mortality in the average Lodgepole Pine stand a few years after cutting; bark beetles are of secondary importance, and losses from this cause increase as the volume of the reserve stand increases owing to the presence of more trees of low vigour (p. 29).

24.4. *Shelterbelts. Windbreaks*

24.4 : 23.21 : 23.24.2 : 24.5. ESCOBAR, R. El arbolado de las carreteras. **[Planting trees along roads.]** *Ciencia (Mexico)* 1 (10), 1940 (463–4). [Span.] Biol. Abstr. 17 (6861).

Species of trees suitable for this purpose, and methods of planting and tending are discussed.

24.4 (78.6) : 23.21 : 12.25 : 12.26–8 : 23.24 : 45.3. ISAAC, E. E. **Shelter belts for Montana.** *Bull. Mont. Ext. Serv.* No. 194, 1941. pp. 20.

Information is given on methods for establishing shelterbelts with particular reference to soil preparation, planting, cultivation, pruning and choice of species. It is recommended that every shelterbelt should contain some evergreens. Brief notes describing habit of growth and site requirements are given for a number of evergreen and broadleaved species that may be used for farm planting. A discussion of some of the more important insects that attack shelterbelt and shade trees in Montana is appended.

24.5. *Pruning*

24.51 : 12.25 : 56.01–2. BULL, H. **Pruning practices in open-grown Longleaf Pine in relation to growth.** *J. For.* 41, 1943 (174–9). [Southern Forest Exp. Sta., New Orleans, La.]

Information is given on the effects of different heights of pruning on growth for open-grown Longleaf Pine (*Pinus palustris*) in southern Mississippi, based on tests made on 1,443 trees ranging from 1 to 8 in. d.b.h. and from 5 to 48 ft. high. Pruning practice for open-grown Longleaf Pine is discussed on the basis of this information and the following conclusions are reached:— (1) Net returns are about the same whether pruning to clear one 16-ft. log is done as soon as possible without incurring any loss in growth, or somewhat earlier with a resultant loss of about 0·4 in. in diameter growth. (2) Still earlier and heavier pruning that results in a loss of about 1·2 in. in diameter growth is probably less profitable than conservative pruning. (3) The pruning of all branches leaving only the leader, is definitely less profitable than conservative pruning. (4) If 8-ft. lumber or similar short lengths will be manufactured, it is more profitable to clear one 16-ft. log in two operations (first, when the trees are 18 ft. high; second, when they are 34 ft. high) than in either a single operation (when the trees are 34 ft. high) or in more than two operations. If only 16-ft. lengths of lumber will be manufactured, a 16-ft. log should be pruned in a single operation. (5) Pruning should be restricted to trees at least 18 ft. high. (6) Open-grown trees should be pruned to 40–50 per cent. of their total height, and, under some circumstances, pruning might be extended to 60 or 70 per cent. of total height. *From author's summary.*

24.51 : 12.25 : 07.7. BRITISH COLUMBIA. **Report of the Forest Branch for the year ended December 31st, 1942.** King's Printer, Victoria, B.C. 1943. pp. 69 + plates.

A comprehensive study has been started to determine the cost of pruning Douglas Fir, using various tools and methods, and ultimately to determine whether additional returns from clear wood will cover cost of pruning. Preliminary results from this work indicate that healing was rapid on those trees pruned late in May, and that there were only slight differences in the time required in using each of the tools tested, per unit of work; the tools included four different California (curved) type saws and one pruner (shears) (pp. 17–8).

3. FOREST UTILIZATION. FOREST TECHNOLOGY

31. PROPERTIES AND ANATOMY OF WOOD. WOOD RESEARCH

31 (43.1–5) : 06.1. Deutsche Gesellschaft für Holzforschung. **[German Association for Wood Research.]** *Holztechnik* 22, 1942 (277–8). [G.]

This Association was founded on the 25th November, 1942. Its purpose is to organize and develop timber research and to apply the results on a practical scale. The Association is the central body of scientific and business organizations interested in wood. Its work is conducted by committees, of which six have been established so far, covering the following subjects:— (1) timber production; (2) wood-working; (3) timber in the building industry; (4) improved wood and related matters; (5) wood chemistry; (6) protection of wood.

31 (97). COX, H. A. [Ed.] **A handbook of Empire timbers (war emergency supplement).** H.M. Stationery Office, London. 1943. pp. 42. D.S.I.R. [Forest Products Research Laboratory.]

This supplement to 'A handbook of Empire timbers', which was published in 1939 [cf. *For. Abstr.* 1 (311)], contains (1) additional information on 31 hardwoods and 7 softwoods that were included in the 1939 edition, and (2) information on 12 hardwoods and 8 softwoods that were not included in that edition. Three appendices give information on (*a*) approximate kiln schedules for a wide range of timbers, to be applied where material is of average quality and intended for normal use; (*b*) mechanical and physical properties of Empire timbers; (*c*) specifications for the teeth of circular saws.

31.0. *General Information on Woods*

31.0 : 12.26–8. *Timber Leaflets* Nos. 79–82. Timber Development Association, Ltd., 75, Cannon Street, London, E.C.4. 1943.

Additions to the series noted in *For. Abstr.* 4 (30).

31.0 : 12.26–8. **The properties of Australian timbers: Red Bloodwood (*Eucalyptus gummifera* (Gaertn.)**

Hochr.). *Mon. News Lett. Div. For. Prod. Aust.* No. 123, 1942 (3).

31.0 (81) : 38.2. Botteux, H. Maderas construção de Santa Catarina. **[Constructional timber of Santa Catarina.]** *Publ. Santa Catarina Inst. Brasil. Georg. Estatis* No. 27, 1942. pp. 108 + plate. [Port.] U.S.D.A. Bibliog. (Plant Science) 1 (D–145).

Vernacular names, followed by scientific names with short descriptions of each (pp. 15–108).

31.1. *Structure. Anatomy. Identification*

31.1 (7 : 8) : 12.25 : 12.26–8 : 31.3. Record, S. J., and Hess, R. W. **Timbers of the New World.** Yale University Press, New Haven. 1943. pp. xv + 640 + plates.

For its size this book contains an extraordinary amount of information—and it is a large book. It is concerned primarily with timbers, but includes also a great many useful facts about the trees that produce these timbers and about products other than timber; the claim in the publisher's notice, that the book should be useful to everyone who is interested in trees and forest products, appears to be fully justified.

The book has been well planned for ease of reference, and the information it contains is readily accessible to either scientist or layman. The timbers are grouped in families and both the families and the genera in them are arranged alphabetically. Each family is prefaced by a general account of its chief botanical features, its economic importance and distribution (including important non-American species), and a summary of its wood characters. Each genus is then described in detail, following the same general plan, with special reference to the most important species. Nearly every family and generic description includes an account of the minute anatomy of the wood, though this has been omitted for some of the less important trees. The anatomical descriptions are admirably informative yet concise, and the unimportant details which may take up so much space have been left out. The following enumeration of the subjects covered by these lists will give a very good idea of the type of information included in the text in addition to wood anatomy:—bark used for cordage, etc.; bark containing aromatic substances, malodorous substances, bitter juices, alkaloids and glucosides, milky latex and red or yellow juices; dyestuffs and tannin in economic quantities; seeds of economic importance for oil, fat or starch; the most important families and genera of hardwoods in temperate North America and those of tropical America best known to foreign commerce; the principal tropical American families supplying hardwood lumber suitable for general construction, carpentry and furniture; very light and soft woods; woods noted for their natural resistance to decay; attractively coloured woods; woods oily or waxy in appearance or to the touch, distinctive in odour and taste, and yielding ethereal oils; wood similar to Birch, Boxwood, Maple, Red Gum, Walnut and Yellow Poplar and possible substitutes for Teak; woods suitable for archery bows and bentwork; woods used for boxes and crates, cooperage, fishing rods, match sticks and tool handles.

For those who need it, there is at the end a concise explanation of the anatomical features described and of their significance, illustrated by seventy-five well chosen and admirably reproduced photomicrographs. The bibliography is extensive and is conveniently arranged according to geographical regions, and the index numbers more than fifty pages.

Both published and unpublished sources appear to have been very thoroughly combed for facts to supplement the store of knowledge accumulated over a period of twenty-five years of research on these timbers. The senior author has for many years been closely concerned with problems of the botanical identity of South American timbers and has himself been largely instrumental in securing the solution of many of them. It can be safely assumed, therefore, that the book is as up-to-date in the matter of nomenclature as it is possible for such a book to be, and for a work covering, as this does, over 150 families and 1,100 genera, this is very important. On these and other grounds one may safely predict that the book will have an exceptionally long life before it becomes seriously out of date, and the authors are to be congratulated on having made an outstanding contribution to forestry literature.

L. Chalk.

31.1. Record, S. J. **Keys to American woods** (continued). *Trop. Woods* No. 73, 1943 (23–42).

[Cf. *For. Abstr.* 4 (320).] Keys are presented for two further groups of American genera:—(4) woods with vessels virtually all solitary (pores rarely in contact radially); (5) woods having vessels with spiral thickenings. The first group consists mainly of tropical species, the second of species from temperate regions.

31.1 : 12.25. Grondal, B. L., and Mottet, A. L. **Characteristics and significance of white floccose aggregates in the wood of Western Hemlock.** *Univ. Wash. For. Cl. Quart.* 16 (1), 1942–43 (13–8 + plate).

A description is given of microscopical, pathological, and microchemical tests on 'floccosoids', which are small, white, floccose flecks and streaks that occur frequently in the wood of Western Hemlock. These are often confused with the white pockets caused by the action of *Trametes pini*, with the result that considerable quantities of aircraft timber are needlessly rejected. While no conclusion could be reached as to the chemical identity of the 'floccosoids', it appears highly improbable that their presence has any effect on the strength of the wood. Simple tests are recommended which allow of distinguishing 'floccosoids' from symptoms of decay.

31.1 : 12.25. Matzke, E. B., and Hulbary, R. L. **An analysis of the wood of the three commercial species of White Pine.** *Bull. Torrey bot. Cl.* 69, 1942 (573–82). [Columbia University, New York.] O.B.D.

The pits of the ray parenchyma cells in contact with the tracheids are described in detail for *Pinus strobus*, *P. lambertiana* and *P. monticola*. In the features studied, both gross and microscopic, *P. monticola* was found to be intermediate between the other two species.

31.1 (213) : 12.25–8 : 33.32. Runkel, R. **Cell walls and cellulose from tropical trees.** *Umschau* 45, 1941 (230–4). [G.] Chem. Abstr. 36 (6340). P.R.

The wall structure of some tropical trees is described, and the suitability of these trees as a source for paper pulp is discussed.

31.1 : 12.26–8 : 33.32. Klauditz, W. Über den Markstrahlanteil einiger Laubhölzer unter Berücksichtigung papiertechnischer Fragen. **[On the proportion of medullary rays in some hardwood timbers from**

the point of view of paper technology.] *Holz* 5, 1942 (145–8). [G.g.] [Reichsanstalt für Holzforschung, Eberswalde.] P.R.

In paper manufacture, medullary rays can generally be regarded as the least valuable type of cells in hardwood timbers. The author gives approximate data on the proportion by weight of medullary rays in the timber of 8 hardwood species. This proportion varies from 4 per cent. in White Birch to 15·2 per cent. in Beech. As against this, the proportion of sclerenchyma is 73 per cent. in Beech and 86 per cent. in White Birch.

31.1 : 12.26–8. PRESTON, R. D. **Wall structure and growth.—I. Spring vessels in some ring-porous Dicotyledons.** *Repr.* from *Ann. Bot., Lond.* (*n.s.*) 3, 1939 (507–30 + plates). [University of Leeds.]

Examination under a polarizing microscope of vessel elements from the outer annual rings of the trunk wood of seven dicotyledonous trees showed that most of the elements were composed of cellulose chains lying in one direction only, and that these chains formed a rather flat spiral. The possible mode of formation of the secondary wall is indicated.

31.2. *Physical Properties*

31.2 : 12.25 : 12.26–8. STAUDACHER, E. Schweizerische Bau- und Werkhölzer. [**Swiss timbers.**] *Mitt. Schweiz. Anst. forstl. Versuchsw.* 22, 1942 (209–376). [G.g.]

Report on investigations during 1936 to 1941 on freshly-felled timber of Norway Spruce, Silver Fir, Larch, Beech, and Oak at the Eidg. Materialprüfungs- und Versuchsanstalt, Zurich, carried out in collaboration with the Swiss Federal Forest Research Station. Data are presented on the texture, density, moisture content, pressure resistance, tensile strength, bending strength, shearing strength, resistance to impact, and shrinkage in drying, as determined on specimens free of defect.

31.2 (54) : 12.25–8 : 33.8. REHMAN, M. A., and ISHAQ, S. M. **A preliminary note on the suitability of Indian woods for battery separators.** *Indian For. Leafl.* (*Utilisation*) No. 14, 1942. pp. 4. [Forest Research Institute, Dehra Dun.]

From the investigations described in this leaflet it appears that the woods of *Adina cordifolia*, *Cupressus torulosa*, *Michelia champaca* and *Talauma phellocarpa* are suitable for battery separators.

31.2 (54) : 33.6 : 33.15. LIMAYE, V. D., and SULTAN MOHAMMED. **The testing and suitability of Indian timbers for plywood tea chests.** *Indian For. Rec.* (*n.s.*) *Utilisation* 2, 1942 (179–90 + plates).

Methods for the testing of plywood tea chests, as carried out at the Forest Research Institute at Dehra Dun, are described. The peeling qualities and the suitability or otherwise of 19 species of Indian woods for tea box plywood are described, and the test results on the same species are recorded. *From authors' summary.*

31.21. Conductivity

31.21.4 : 11.11.2. GEIGER, F. Über die Abkühlung und die spezifische Wärme trockener und feuchter Hölzer. [**On the cooling and the specific heat of dry and moist timbers.**] *Holz* 5, 1942 (148–52). [G.g.] P.R.

Using a specially constructed freezing apparatus, rate-of-cooling curves were obtained for dry and wet specimens of different timbers at – 30° C. and an air movement of 10 m. per second. These curves were then used to calculate for each specimen the rate of freezing, the heat given off in freezing, and the specific heat.

31.21.4 : 31.1. WANGAARD, F. F. **The effect of wood structure upon heat conductivity.** *Repr.* from *Trans. Amer. Soc. mech. Engrs.* 1942. pp. 8. [University of Washington, Seattle.]

Although specific gravity and moisture content of wood are the chief factors affecting transverse conductivity of heat, average departures from this relationship have been determined for a representative group of species and their tentative acceptance for practical purposes is proposed. The orientation of fibrils in the cell walls of wood is shown to account for the greater part of the variation about conductivity values anticipated on the basis of specific gravity and moisture content in Douglas fir. Similar relationships have been found to exist with respect to the wood of other coniferous species; in fact, the influence of fibril angle upon transverse conductivity of heat may be the chief factor responsible for the average deviation from anticipated values found for most, if not all, of the individual species studied.

Variation in longitudinal-transverse conductivity ratio is also closely related to fibril orientation and definitely substantiates theories previously advanced to the effect that the anisotropic character of the fibrils predominantly influences the differential conductivity of wood in the longitudinal and transverse directions. At least in so far as heat conductivity is concerned, the high fibrillar-angle characteristic of compression wood, not abnormal chemical composition, accounts for the abnormal properties of this type of defective wood.

The close relationship shown between conductivity ratio and fibrillar angle for Douglas Fir suggests a new technique applicable to future investigations into other properties of wood dependent upon this particular structural feature, heretofore only determinable by tedious microscopic or X-ray measurement. Longitudinal-transverse conductivity ratios are also proposed for application in the selection or segregation of various qualities of wood for specialized uses, particularly fo. the detection of mild compression wood. *Author's summary.*

31.21.4 : 33.15 : 01.4. **The penetration of heat into wood.** *Aero Res. Tech. Notes, Bull.* No. 2, 1943. pp. 4. P.R.

A method is described for computing the internal temperature of wood when heated between two external platens as in veneering or plywood manufacture. The distribution of temperature from the outer surface of the panel to the centre can be determined for various periods of heating by means of a graph or series of curves, each curve corresponding to a given period, which varies with the thickness of the panel.

31.22. Relation to Water, Air, Gases

31.22.1. ATKINS, W. R. G. **Determination of the water content of wood and other substances by means of ternary azeotropic mixtures.** *Nature, Lond.* 151 (3833), 1943 (449). [Marine Biological Laboratory, Plymouth.]

The fractional distillation method used by Young and Fortey for quantitative analysis of liquid mixtures can also be used for the quantitative determination of water in solids.

31.22.2. PRESTON, R. D. **Anisotropic contraction of wood and of its constituent cells.** *Forestry* 16, 1942 (32–48). [University of Leeds.]

As a result of observation of cell dimensions and wall structure in fibres of hardwoods and tracheids of softwoods, it appears that the anisotropic shrinkage of these cells on drying arises as a consequence of the anisotropic properties of their cellulose complex. A theoretical discussion is presented of the connexion between swelling behaviour of cellulose and of whole cells, and the experimental observations are found to agree closely with predictions. It therefore follows that anisotropic shrinkage in wood in bulk may also be connected with properties of the cellulose complex, expressed in terms of the cell-types composing the wood. As far as the data now available are concerned, longitudinal shrinkage in wood appears to be of the same order as that observed here in single cells; and further yields a figure for the average micellar inclination of the constituent cells very close to that determined by direct observation. Various other features of anisotropic shrinkage of wood prove also to be in harmony with the present theory. Finally, it appears that the development of stresses in growing timber may not be unconnected with the swelling properties of its constituent cells, following the lines of the present theory. *From author's summary.*

31.22.2 : 31.27. BARKAS, W. W. **Wood water relationships. VIII. Some elastic constants and swelling pressures of natural wood and of its gel material.** *Trans. Faraday Soc.* 38, 1942 (447–62). [Forest Products Research Laboratory, Princes Risborough, Bucks.] L.S.

On the basic assumption that the wood cell is geometrically equivalent to a uniform hollow cylinder, isotropic in the transverse plane, whose longitudinal swelling is small compared with the transverse, equations have been derived giving limits to the possible values of the swelling pressures and to some elastic constants of wood in terms of measurable adsorption and swelling properties of the material.

31.22.2 : 33.31. STAMM, A. J. (to the Secretary of Agriculture of the U.S.A. and his successors in office). **Antishrink treatment for wood.** *U.S. Patent* No. 2,296,316, Sept. 22, 1942. Chem. Abstr. 37 (1240). P.R.

Dry wood (such as boards of about 1-in. thickness) is treated for reducing swelling and shrinkage by continuously passing it beneath the surface of a fused mixture of NaOAc and KOAc heated to about 550° F., at such a rate that 1-in. thick wood is immersed for about a half hour, while excluding air from the wood, and then removing any adhering salt and surface char from the wood, as by scraping or scrubbing.

31.22.3 : 33.15 : 12.25. HAWKINS, R. S. **Water absorption of resin-impregnated Oregon Pine.** *Plastics Trends* 2 (2), 1942 (1–2). Chem. Abstr. 37 (245–6). P.R.

Water absorption is diminished by treatment with solution of phenolic resin.

31.22.3 : 33.15 : 12.25. GRUSH, F. J. **Water-absorption properties of resin-impregnated Oregon Pine.** *Plastics Trends* 2 (10), 1942 (8). Chem. Abstr. 37 (246). P.R.

Cf. preceding abstract.

31.24. Calorific Value

31.24 : 07.7 : 33.06. SCHAPHORST, W. F. **Simplified efficiency chart for lumber plant boilers.** *Sth. Lumberm.* 166 (2083), 1943 (51).

The chart will give approximate efficiency of a steam boiler if information is available on the chimney gas temperature and the heat value of the fuel.

31.27. Mechanical Strength

31.27 : 01.4. YLINEN, A. Ein neues Messverfahren für die Bestimmung der Schubmoduln des Holzes. [**A new method of measuring the thrust moduli of wood.**] *Holz* 5, 1942 (375–6). [G.g.] P.R.

Description of a new testing apparatus for the determination of the different moduli of thrust for wood specimens. It is claimed to give reliable results.

31.27 : 12.25 : 33.53. **Larch and Scots Pine poles. Report on tests on home grown timbers.** *Electrician* 130, 1943 (77–80). L.S.

Tests were made 'to measure the average value of deflection of Larch [*Larix europaea*] and Scots Pine poles, rigidly supported at 5 ft. from the butt, for any given loading, up to the ultimate load, applied at 2 ft. from the top of the pole; to obtain a value for the ultimate breaking load of Larch and Scots Pine poles; and to calculate the average value of fibre stress for Larch and Scots Pine poles'. The poles used in the tests were 36 ft. long by 11½ in. in diameter at 5 ft. from the butt, with an average diameter of 8½ in. at the top. Results show that the deflection for any given loading is much greater for Scots Pine than for Larch poles. The former would therefore appear to be more elastic. Larch poles showed a much greater ultimate strength, the ultimate fibre stress being of the order of 10,500 lb. per sq. in. as against 6,500 lb. for Scots Pine.

31.27 : 12.25 (43.9). PALLAY, N. A miskolci erdei- és veresfenyö szilárdsági vizsgálata. [**Strength tests of Larch and Pine timber from the vicinity of Miskolc, Hungary.**] *Erdész. kisérl.* (*Sopron*) 43 (1/2), 1941 (135–65). [Hung.g.] Biol. Abstr. 17 (2786).

Samples of wood grown in the northern part of the Bükk Mountains of Hungary were tested. The Larch was from a 110-year-old stand, the Pine from 59-year-old and 109-year-old stands.

31.27 : 31.8 : 12.25. YLINEN, A. Dehnungsmessungen in der Umgebung von Ästen beim Kiefernholz. [**Flexion tests in the surroundings of knots in Pine timber.**] *Holz* 5, 1942 (337–8). [G.] P.R.

Data are given from a few tests that were carried out in order to get an approximate idea of the mechanics of timber breakage in the vicinity of a knot. The study of the influence of knots on the strength properties of timber is rendered difficult because of the complicated tensions which occur in the neighbourhood of knots and the abnormal properties of the wood forming the knots.

31.27 : 33.15. HEARMON, R. F. S. **The significance of coupling between shear and extension in the elastic behaviour of wood and plywood.** *Repr.* from *Proc. phys. Soc.* 55 (pt. 1), 1943 (67–80). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

The effect on the elastic behaviour of wood and plywood of coefficients such as S'_{16} (coupling coefficients) in the generalized Hooke's Law is considered. It is shown that for specimens cut at angles to the principal

directions, these coefficients may differ from zero. This implies a difference between 'pure' and 'free' elastic constants for such specimens, a difference which is verified experimentally. The existence of coupling coefficients introduces uncertainties into the calculation of the free Young's and rigidity moduli from the frequencies of flexural and torsional vibrations, but it is shown that the free constants can be measured to sufficient accuracy by working on specimens of suitable length. Finally, it is shown that the elastic behaviour of plywood cut at an angle to the grain may be determined as much by the pure elastic constants of the individual plies as by the free constants. *Author's summary.*

31.27 : 33.32 : 33.15. BOND, J. **Bearing strength: plastics and plywood.** *Modern Plastics* 19 (11), 1942 (70–3, 110). *Abstr.* in *Bull. Inst. Paper Chem.* 13 (30). P.O.

A study on the bearing strength of several reinforced plastics was made; the test methods discussed in this paper are applicable to all types of plastics. The specimens used were representative of commercially available high-impact moulded and laminated plastic sheets and resin-bonded Birch plywood. The plywoods were definitely inferior to the reinforced plastics in bearing strength. In nearly all cases heating improved and soaking in water decreased the strength of the material as compared with that at 55 per cent. relative humidity.

31.3. *Chemical Properties*

31.3. LÜDTKE, M. Über die Pektinstoffe des Holzes. **[On the pectin substances of wood.]** *Holz* 5, 1942 (338–44). [G.] P.R.

A survey of literature on the presence of pectins in wood, their separation therefrom, the pectin content of different timbers, the composition of the pectins, their relation to other substances in the cell wall, the presence of acid substances other than pectins in the cell wall, and the function of wood pectins.

31.3. YORSTON, F. H. **Recent advances in the chemistry of wood, 1942.** *Pulp Paper Mag. Can.* 44 (2), 1943 (197–8, 200). [Appendix A, Wood Chemistry Committee report, 1942, Canadian Pulp and Paper Association.]

A brief review of the literature, particularly that from North America, for the period December, 1941 to September, 1942, on wood chemistry, the subject being discussed under the three headings:—structure and composition of wood; cellulose; and lignin. A list of 38 references is included.

31.3 : 01.4. **Sampling and preparing wood for analysis: TAPPI tentative standard T11 m-42.** *Paper Tr. J.* 115 (13), 1942 (38). P.R.

The procedure is given for the preparation of wood samples, either from logs or from subdivided material such as chips or sawdust, for all chemical tests except the determination of cellulose.

31.3 : 12.25. MOSIMANN, H., and SVEDBERG, T. **Sedimentation and diffusion measurements of the polysaccharide from Larchwood.** *Kolloid-Z.* 100 (1), 1942 (99–105). [G.] *Abstr.* in *Bull. Inst. Paper Chem.* 13 (173). P.O.

In connexion with a study of the substances which accompany cellulose in wood, the water-soluble polysaccharides extractable from Larchwood were ultracentrifuged with approximately 60,000 r.p.m. Sedimentation diagrams showed that the centrifuged substance contains two components of different molecular weight, approximately 16,000 and 100,000. The first component was found to be a uniform substance; the other gave diffusion constants indicating slight polydispersity. However, a uniform composition of the second component is not impossible. Four diagrams, two tables and 20 references are included.

31.3 : 12.26–8. KLAUDITZ, W. Zur Kenntnis der Cellulose in der Zellwand der Laubhölzer. **[The cellulose in the cell walls of hardwoods.]** *Papierfabrikant* 39, 1941 (225–8). [G.] P.R.

The author attempted to prepare high-viscosity hardwood celluloses, after pre-treatment with aqueous NaOH. Woods used were *Fagus sylvatica*, *Tilia parvifolia* and *Fraxinus excelsior*. Details are given of the methods used and results obtained.

31.3 : 12.26–8. VIRASORO, E. **Extraction of lignin from White Quebracho wood by ethyl acetoacetate and phenol.** *An. Inst. Investig. cient. tecnol.* (Univ. nacl. litoral, Santa Fé, Argentina.) 10–11, 1942 (75–89). Chem. Abstr. 37 (764). P.R.

31.4. *Durability. Decomposition*

31.41. Natural Durability

31.41 : 12.25 (410). CARTWRIGHT, K. ST. G. **The variability in resistance to decay of the heartwood of home-grown European Larch, *Larix decidua*, Mill. (*L. europaea*) and its relation to position in the log.** *Forestry* 16, 1942 (49–51). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

The tests were made on wood from a 95-year-old tree having an average growth of 10 rings per inch and a clear bole about 45 ft. high; test fungi included *Polyporus schweinitzii*, *Poria xantha* and *Fomes annosus*. The wood taken from the basal area was on the whole the most durable. Within the basal section and at a point 40 ft. up the bole the heartwood adjacent to the sapwood showed greater resistance than that next the pith, whereas at a point 20 ft. from the base the reverse results were obtained with *Poria xantha*. Tests on samples from the basal area showed that the increase in resistance from the centre outwards towards the sapwood is progressive. [Cf. *For. Abstr.* 4 (35).]

31.42. Attack by Plant Organisms

31.42 : 12.21 : 11.11. JAHN, E. Über die angeblichen Arten des Hausschwammes. **[On the so-called species of dry rot.]** *Ber. dtsch. bot. Ges.* 59, 1941 (233–45). [G.] *Abstr.* in *Holz* 5, 1942 (211). [G.] P.R.

The four species of dry rot established by Falck, *Merulius domesticus*, *M. silvester*, *M. minor* and *M. sclerotiorum* are discussed critically. *M. silvester* is regarded as a 'wild' form of the true dry rot (*M. lacrymans*) and while at room temperature (20° C.) it is not so destructive as the latter, it has been shown experimentally to be more so at 15°–16° C. Woodland forms of recognized wood-destroying fungi can cause intensive rotting at lower and at higher temperatures than those types commonly found in buildings. *M. silvester* is a physiological race of *M. lacrymans*, *M. minor* is regarded as an immature aberrant type of the same, and *M. sclerotiorum* is synonymous with *M. hydnoides* P. Henn. The copious growth of *M. silvester* in culture at room temperature is attributed to an intensive secretion of liquid due to unfavourable temperature conditions. There is also a 'wild' form of

Coniophora with substantially different temperature curves.

31.42 : 12.25. FINDLAY, W. P. K. **Resistance to decay of *Pinus strobus*.** *Emp. For. J.* 21, 1942 (134). [Forest Products Research Laboratory, Princes Risborough.]

Results from standard laboratory tests indicated that there is little difference in the resistance to decay of the timber of *Pinus strobus* and *P. sylvestris*, and it is concluded that timber of *P. strobus* should be classified as 'moderately resistant' to fungal decay.

31.42 : 12.25 : 12.26–8 : 12.21. SCHULZE, B. Mykologische Prüfung der Tropeneignung organischer Werkstoffe, insbesondere von Holz. **[Mycological test on the suitability for tropical use of organic raw materials, especially wood.]** *Holz* 5, 1942 (345–50). [G.g.] [Staatliches Materialprüfungsamt Berlin-Dahlem und Vierjahresplaninstitut für Werkstofforschung.] P.R.

A description of the laboratory technique developed as a substitute for open-air tests under tropical conditions. The tests are carried out at a constant temperature of 28° C. in moisture-saturated air. From the results obtained with Pine and Beech timber the author recommends the use of *Polystictus versicolor*, *Poria contigua*, and *Coniophora cerebella* in testing hardwood specimens, and *Lenzites trabea*, *Poria contigua*, *Coniophora cerebella*, and *Lentinus lepideus* in testing softwood specimens.

31.42 : 12.26–8. FINDLAY, W. P. K. **Resistance to decay.** *Emp. For. J.* 21, 1942 (134).

In standard laboratory tests Akomu (*Pycnanthes kombo*) from West Africa showed, after four months' exposure, some resistance to fungi which cause brown rots (*Merulius lacrymans*, *Coniophera cerebella*, *Poria vaillantii*, and *Lenzites trabea*) but was readily and severely attacked by fungi causing white rots (*Polystictus versicolor* and *P. sanguineus*); Peroba Rosa (*Aspidosperma polyneuron*) from Brazil showed high resistance to fungal decay and there was no evidence that variations in colour of heartwood are related to variations in resistance to decay.

31.42–3 : 31.41. **Recognition of decay and insect damage in timbers for aircraft and other purposes.** D.S.I.R. Forest Products Research. H.M. Stationery Office, London. 1943. pp. 17 + plates.

Information on the subject is presented as follows:—(1) Distinction between dote (incipient decay) and other discoloration. It is emphasized that sap stain and incipient decay are not identical; however, both may occur in the same piece of timber. Sap stain appears to have little or no effect on any strength property except, in extreme cases, on shock resistance. General distinctions between sap stain and incipient decay and natural discolorations are tabulated. (2) Defects caused by insects. A key is given for the recognition of the common types of insect attack in converted timber (in Great Britain), the relative importance of different types of defect is discussed in relation to aircraft timbers, and the frequency of occurrence of defects is shown for various timber species. (3) The defects characteristic of individual timbers are described. (4) Certain timbers in general use are listed alphabetically under their standard common names and notes are included on their resistance to decay and insect attack.

31.42.1 : 31.8 : 12.25. BAXTER, D. V., and VARNER, R. W. **Importance of fungi and defects in handling Alaskan airplance Spruce.** *Circ. Univ. Mich. Sch. For. Conserv.* No. 6, 1942. pp. 35. P.R.

Sitka Spruce of quality suitable for aeroplane construction is found over extensive areas on the mainland and islands of southeastern Alaska, particularly in the Western Hemlock/Sitka Spruce type on the better-drained lowland sites. The value of this timber for aeroplane construction may be greatly reduced by the presence of defects including spiral grain and incipient decay. A number of fungi are known to attack the wood both in the forests and mill yards.

As apparently little is known of any except the more common fungi in this region, a study was made of certain of the Spruce-inhabiting species. Isolations were made and cultured on malt agar and on wood blocks, and a key to the fungi was prepared from a study of their characteristics and rate of growth in culture. Based on information obtained from these laboratory tests and field observations, recommendations are made for the handling of Sitka Spruce timber in order to keep defect at a minimum.

31.42.11 : 12.21 : 33.53. BARGHOORN, E. S. **The occurrence and significance of marine cellulose-destroying fungi.** *Science* (*n.s.*) 96, 1942 (358–9). L.S.

New species of marine fungi that readily attack wood and other cellulosic plant materials under marine conditions have been found to be of common occurrence along the North Atlantic coast, the present known range being from Newfoundland to New York Harbour. Pure cultures of ten of these fungi have been obtained from wooden test blocks and other species have been isolated from decaying piling. Fungi so far isolated belong to the Pyrenomycete group of the Ascomycetes and to several groups of the Fungi imperfecti. Extensive studies are being made of these organisms.

31.42.11 : 12.21. ROBAK, H. **Cultural studies in some Norwegian wood-destroying fungi: A biological study and contribution to diagnostics of wood decay.** *Medd. Vestland. forstl. Forsøksta.* 7 (3), 1942. pp. 248 + plates. [E.e.nor.] N.D.A.

The appearance and behaviour in culture on a wide range of media, including wood blocks and sawdust, of the following fungi are described in considerable detail:—*Corticium evolvens* (= *C. laeve*), *Stereum purpureum*, *S. sanguinolentum*, *Polyporus abietinus* (= *Polystictus abietinus*) *Lenzites sepiaria*, *Trametes serialis* and *T. odorata*. The sexuality of these fungi was investigated by pairing mycelia from monosporous cultures and by this means it was shown that *S. purpureum* and *S. rugosiusculum* are the same species. The reactions of these fungi when grown on media containing gallic acid, tannic acid and aniline blue are noted and their temperature relations are given. The chemical changes induced by the fungi in Pine sapwood and heartwood were examined and the increases in sugar content of the extractives from decayed wood were measured.

The influence of the presence of bacteria isolated from wood on the rate of decay of Spruce sawdust by *P. abietinus*, *L. saepiaria* and *T. serialis* was examined. It was concluded that decay induced by *L. saepiaria* may be increased by the simultaneous action of certain bacteria, but with the other two species tested the added bacteria in neither case increased the rate of decay.

W. P. K. F.

31.42.11 : 31.27 : 33.36.1. TRENDELENBURG, R. **The reduction in time required for fungus tests on wood by means of impact bending tests.** *Holz* 3, 1940 (397–407). [G.] Chem. Abstr. 36 (5628). P.R.

The action of wood-destroying fungi affects most strength properties of wood more quickly than it affects weight of wood. A method for testing wood preservatives is described whereby reduction in strength under impact bending after 30 days rather than loss in weight after 4 months is measured. Two pieces of wood, 8·5 × 8·5 × 120 mm., were exposed for 30 days to fungus cultures in Kolle flasks and then dried and broken. Two controls kept under humid but sterile conditions were likewise dried and broken. Loss in strength up to 80 per cent. was obtained as contrasted with a loss in weight of 10 per cent. The method is suitable for testing the natural decay resistance of species as well as the effectiveness of preservatives.

31.42.11 : 33.52 : 33.54 : 12.26–8 : 12.21 : 33.36.3. ROTH, E. R. **Effect of invisible decay on deterioration of untreated Oak ties and posts.** *J. For.* 41, 1943 (117–21). [U.S.B.A. Bureau of Plant Industry, Asheville, N.C.]

A study was made to compare the rate of decay in ties and posts made from sound wood and in those made of wood containing incipient decay, and also to compare seasoned and green material. Examination at the end of 5 and 6 years showed that the pieces orginally infected had on the average decayed to a greater extent than the wood originally sound. All of the fungi isolated were present in both sound and infected ties and posts, but the volume of decay was usually greater in the infected than in the originally sound material.

Seasoning untreated Oak ties and posts cut in the fall, for an 8-month period, makes very little difference in their durability.

31.42.11 : 33.7 : 31.24 : 31.3 : 12.26–8 : 12.21. HILBORN, M. T., and STEINMETZ, F. H. **The calorific value and chemical composition of decayed cordwood.** *Phytopathology* 33, 1943 (45–50). [Univ. of Maine Agric. Exp. Sta.]

Loss in the calorific value of cordwood of Red Maple, Paper Birch and Beech, due to decay (primarily by white-rot fungi), was slower than the loss in wood substance, but chemical analysis failed to show any correlation between reduction in calorific value and reduction in the amount of any chemical constituent of the wood.

31.42.12 : 12.21 : 33.36.3. Le bleuissement du bois résineux. **[Bluing of resinous wood.]** *Ann. Éc. nat. For.* 8 (1), 1941 (109–15). [F.] Biol. Abstr. 17 (7055).

The bluish colour of resinous wood is caused by the mycelia of various fungi. The most frequent are *Ceratostomella pini*, *C. coerulea*, *C. piceae*, *C. pluriannulata*, *Discula pinicola*, *Hormonema dermatioides*, *Trichosporium tingens* and *Leptographium lundbergii*. Bluing of wood can be avoided only with difficulty. The best preventive is rapid drying after cutting.

31.43. Attack by Animal Organisms

31.43 : 12.25 : 13.2. BESS, H. A. **Sawyers riddle fire-killed Pine and Spruce.** *J. For.* 41, 1943 (69). [U.S. Bureau of Entomology and Plant Quarantine.]

The following recommendations are based on experience in salvaging fire-killed Pine and Spruce in New Hampshire:—(1) The most valuable timber, Pine or Spruce, should be out of the forest before June 1st. (2) Logs cut during June should at once be sawn into lumber or stored in water. (3) Round-edged lumber sawn in June from logs containing sawyers (*Monochamus scutellatus*) should be kiln dried or air seasoned as soon as possible. Salvage operations should be completed by July 1st.

31.43 : 12.26–8 : 13.2 : 05.3 (68.9). SOUTHERN RHODESIA. **Annual report for the year 1941. Divsion of Entomology.** Department of Agriculture and Lands, Salisbury, S. Rhodesia. 1942. pp. 19. I.I.E.

Serious borer (*Bostrychopsis* sp.) infestation is reported in the sapwood of Mukwe (*Pterocarpus angolensis*) in floors of newly built houses.

31.43 : 13.2 : 33.36.1. KALTWASSER, J. Wachstumsgeschwindigkeit und Giftresistenz der Larven des Hausbockkäfers *Hylotrupes bajulus*. **[Rate of growth and resistance to poison of the larvae of the longicorn beetle *Hylotrupes bajulus*.]** *Mitt. biol. Reichsanst. Berl.* 63, 1941 (86–7). [G.] *Abstr.* in *Z. PflKrankh.* 52 (339). I.I.E.

Larvae showed the greatest growth in the outer wood of a Spruce tree that had been felled for a year; in other woods the growth of larvae was always greater in the outer than in the inner portions of sapwood and in seasoned than in green wood. Investigations undertaken to test the resistance of the insect to poison did not give conclusive results—the larvae can bore without harm for a short distance through wood impregnated with fairly high concentrations of poison.

31.43 : 13.2 (44) : 33.36.1. Les termites de France. **[The termites of France.]** *Ann. Éc. nat. For.* 8 (1), 1941 (117–23). [F.] Biol. Abstr. 17 (7351).

The termites known in France—*Calotermes flavicollis*, *Reticulotermes lucifugus*, *R. flavipes*—damage severely the timbers in which they dig galleries. They usually attack wood that is in contact with moist soil, and they also infest stumps, trunks of trees and living plants. They can be destroyed by toxic vapours and controlled by impregnating the timbers with preserving fluids.

31.43 : 13.2 (67.6–8) : 38.2. HARRIS, W. V. **Termites in East Africa, IV—Termites and buildings.** *E. Afr. agric. J.* 8, 1943 (146–52).

The species of termites most commonly causing damage to buildings in East Africa are *Bellicositermes bellicosus*, *Termes badius*, *Microtermes redenianus*, of the mound-building group, and *Coptotermes amanii* of the subterranean group. There is little evidence of damage by drywood termites. Control measures are discussed with reference to (1) the termite-proof construction of buildings; (2) the use of timber resistant to termite attack; (3) site clearance prior to building; and (4) control of termites in buildings.

31.43 : 38.2. KROGH, P. M. D. Die bedreiging van houtwurmaanval in bouhout en die voorkoming daarvan. **[The threat of wood-borer attack in structural timber and its prevention.]** *J. S. Afr. For. Ass.* No. 9, 1942 (51–4). [Afrik.] [Bosprodukte-Inrigting. Pretoria.]

31.45. Injury by Fire

31.45 : 01.4 : 38.2. MILLER, R. P. **Standard tests check fire resistance of building materials and doors.** *Sth. Lumberm.* 166 (2084), 1943 (51–2).

Two standard tests that have recently been approved by the American Standards Association include (1) American Standard Methods of Fire Tests of Building Construction and Materials (a revision) and (2) American Standard Methods of Fire Tests for Door Assemblies (a new standard).

32. HARVESTING OF WOOD. LOGGING

32.2. *Felling and Related Operations*

32.25 : 07.7. CHALLENGER, J. W. **Power saw development.** *Sth. Lumberm.* 166 (2085), 1943 (44, 46).

A report on experiences gained with power saws during the past five years by Bloedel, Stewart and Welch, Ltd., of Port Alberni, B.C. The Company has now 54 felling machines which have been developed by adapting a German unit (the Stihl power chain saw) to West-Coat conditions. The machines are standardized on one basic pattern, with all parts interchangeable. The use of power saws has enabled the firm to increase the average output of its fellers and buckers by one-third. A good deal of the heavy labour and monotony of handwork has been removed, and there has been a decrease in accidents. The firm has been attempting for some time to design a bucking machine that could be handled by one man, instead of the two men required when a felling machine is used for bucking, and it has now developed a 64-lb. unit driven by a light-weight English motor of 4–6 h.p. The use of this unit has proved a success and it is hoped to develop shortly a one-man felling saw using the same type of motor.

32.25.2 : 07.7. **New electric tree faller.** *Sth. Lumberm.* 166 (2083), 1943 (54–5).

A brief account is given of a new electric power saw developed by E. C. Atkins & Co., of Indianapolis, its method of operation and advantages in use. The saw is driven at the rate of 1,500 ft. per minute by a compact, 10-h.p. motor, which is assembled in the drive end of the saw. A 3-phase cable, usually about 100–200 ft. long, connects the motor with an electric generator which is mounted on a small caterpillar tractor. The 46-in. saw complete with motor weighs 85 lb.

32.25.2 : 12.25 : 01.4. MARCKWORTH, G. D. **Power vs. hand falling: A correlation of stump height and method of cutting in Pine stand.** *Timberman* 44 (4), 1942-43 (50, 52). [University of Washington.]

From measurements of nearly 1,200 stumps, about 700 of which were cut with hand saws and 500 with power saws, it was found that height of stump increased with diameter (i.b.) at the same rate for both methods of cutting and that the stumps of trees felled with power saws averaged 10 in. lower than those cut with hand saws, irrespective of stump diameter. There is an additional saving from the use of power saws in that the undercut is taken from the stump, whereas in hand-saw operations it is taken from the butt log.

32.25.5. WHITE, A. R. **Bark removal from trees.** *Canadian Patent* No. 407,221, Sept. 8, 1942. Chem. Abstr. 36 (6709). P.R.

The tree is girdled to a depth of about 3 annual rings of wood and a toxicant consisting of 3 parts $CaCl_2$ and 1 part Na chlorate is placed in a fabric container and applied around the girdle. The solution is absorbed, destroying the cambium or cortex layer and causing a shrinkage that permits easy removal of the bark.

32.8. *Grading and Storage of Wood in the Rough*

32.8 (59.1) : 12.26–8 : 32.92. LONG, A. **Nyaungwaing depot.** *Indian For.* 68, 1942 (634–41).

Nyaungwaing is primarily a tidal depot for the storage of timber bound for Rangoon. It consists of a stretch of mud flats intersected by small streams and is divided into 10 'guards'. The capacity of the depot varies with the season, being about 42,500 logs in the fine weather months (November to May) and about 30,000 logs in the rainy season. Normally two batches of timber are floated down the Hlaing or Rangoon River to Nyaungwaing each year—once early in the rains (about July–August) and again towards the end of the rains (October). Information is given on problems of organization at the depot, the duties of the staff, and procedures such as log classification, stock-taking, and the despatch of the timber to Rangoon.

32.81 : 12.25. LIMAYE, V. D. **Selection and field testing of aircraft quality Spruce and Fir.** *Indian For. Leafl.* (*Utilisation*) No. 29, 1942. pp. 5 + plate. [Forest Research Institute, Dehra Dun.]

Simple rules are given for the selection and field testing of aircraft quality Spruce and Fir so that the greater part of the low grade timber can be rejected at site in the forest, thus saving the cost of its extraction.

32.9. *Transport*

32.91.22 (79.5–7) : 76.1 : 01.4. **A device for computing truck transportation costs for sawlogs in the Douglas Fir region.** *W. Cst. Lumberm.* 69 (12), 1942 (14–5, 44–6). [The O. and C. Lands Administration, General Land Office, U.S. Department of the Interior.]

The device is in the form of a slide rule on which an indicator chart shows the time and cost effects of each factor that has a consistent tendency to increase or decrease materially the actual operating costs of transportation. To compute log-transportation costs by this slide rule the following information is required:– (1) Road data including length of haul, type of road surface, amount of curvature, and grade percentages for the distances over which the loads must be hauled. (2) The percentage of lumber which is recoverable from the board-foot scale of the logs transported. (3) The average weight in pounds per board foot log scale of the species of timber being hauled. The method of using the slide rule is described and illustrated with examples.

32.91.3 : 33.7. BALDWIN, H. I. **Cordwood chutes.** *J. For.* 41, 1943 (68–9). [Caroline A. Fox Research and Demonstration Forest, Hillsboro, N.H.]

Tests with 12-ft. chutes, constructed of rough 1-in. Pine boards and having flat bottoms 12 to 18 in. wide, showed that about 20° was the minimum grade for dry Oak and Beech cordwood to slide freely. Cleft wood slid best on the flat split side. One man required about ten minutes to transfer a cord of wood directly from the pile to the chute. The chutes were excessively heavy and difficult to move over the rocky hillside.

33. CONVERSION AND PRESERVATION OF WOOD

33.0. *Utilization Categories of Wood*

33.0 (94) : 12.26–8 : 12.25 : 98.1. **The war-time importance of Australian grown timber.** *Mon. News Lett. Div. For. Prod. Aust.* No. 123, 1942 (1–2).

Owing to war-time restrictions Australia has practically ceased importing timbers from abroad and

is almost entirely dependent on the use of locally grown timbers, both native (mostly hardwoods) and exotic. Important instances of the substitution of Australian-grown timbers for previously imported material include Scented Satinwood (*Ceratopetalum apetalum*) for Birch (*Betula* sp.) in aircraft plywood and for Walnut (*Juglans* sp.) in rifle furniture, Hoop Pine (*Araucaria cunninghamii*) for Port Orford Cedar in battery separators, Queensland Maple (*Flindersia brayleyana*) for Mahogany in aircraft propellors and boat building, White Birch (*Schizomeria ovata*) and Radiata Pine for Aspen in matches, Spotted Gum (*Eucalyptus maculata*) for Hickory in axe and hammer handles, Silver Quandong (*Elaeocarpus grandis*) and Hoop Pine for Spruce in spoon-bladed oars, Queensland Maple and Scented Satinwood for Gaboon Mahogany (*Aucoumea klaineana*) and Birch in plywood panels, and Sheoak (*Casuarina* sp.) and Myrtle Beech (*Nothofagus cunninghamii*) for Maple (*Acer* sp.) in boot lasts.

33.0 (945) : 12.26–8. VICTORIA. **Forests Commission of Victoria, Australia: Twenty-third annual report, financial year 1941–42.** Govt. Printer, Melbourne. 1942. pp. 27.

In the adaptation of local timbers to uses for which imported timbers had previously been used, it has been found that Myrtle Beech (*Nothofagus cunninghamii*) is particularly suitable for the manufacture of small tool handles, gun felloes, boot lasts, ladies' shoe heels and clogs. The use of Silver Wattle (*Acacia dealbata*) as a packing-case material has been found to be highly satisfactory and is being extended. Progress has been made in the peeling of both green and fire-killed Mountain Ash and Alpine Ash (*Eucalyptus regnans* and *E. gigantea*) for the production of veneer (p. 11).

33.02. Pulpwood and Chemical Wood

33.02. RIOUX, L. J., and BARSALOU, M. **Some observations on pulpwood types and their preparation in relation to pulp cleanliness.** *Pulp Paper Mag. Can.* 44 (2), 1943 (120–2, 147).

Pulpwood dirt is classified as (*a*) extraneous dirt, including soil, dust, rust and other foreign particles, (*b*) dirt found inside the wood, as caused by bacteria, and (*c*) surface dirt, including bark, knots, weathered wood matter or staining. Dirt of the first two classes should not cause any loss of wood in the sulphite process, while the proper use of the variables in this process should make it possible to produce clear pulp without excessive wood losses because of the presence of bark and staining on wood. It is suggested that only after all possible variables in the sulphite mill have been used to best advantage to reduce pulp dirt, should wood-cleaning processes be intensified to obtain further dirt reductions.

33.02 : 98.1 : 32.81. STEWART, C. G. **Pulpwood procurement problems.** *J. For.* 41, 1943 (138–40).

A summary of a paper that discusses the factors which affect the quality of wood for pulp manufacture—such as the presence and degree of rot, size of material—and which therefore require special attention in the production and purchase of pulpwood.

33.1. *Mechanical Conversion excluding the Manufacture of Mechanical Pulp*

33.12. Furniture and Cabinet Making

33.12. **Wood and the development of fine arts: Wood engraving.** *Timber of Canada* 3 (5), 1943 (27–9).

33.13. Cooperage. Shingles

33.13. (729.2) : 12.25 : 12.26–8. BURNS, L. V. **Roofing shingles in Jamaica.** *Carib. For.* 4, 1942 (9–15). [E.e.span.]

Notes on manufacture and use. The most important shingle woods are *Cedrela odorata* and *Terminalia latifolia*. The best shingles are made by primitive hand methods, being split out of blocks of wood with a froe. Recently several sawmills have been erected for the manufacture of sawn shingles.

33.15. Manufacture of Veneers and Laminated Wood. Gluing

33.15. **Modern gluing methods.** *Wood* 8, 1943 (90–1).

An illustrated note on recent methods of gluing wood using synthetic resin glues.

33.15. **Molded plywood planes: Vidal method of 'bag gluing'.** *Timberman* 44, 1942–43 (70–1, 91).

33.15. **Now comes 'spot welding with glue'.** *Timberman* 44 (5), 1942–4 (62).

A description of a new process for gluing narrow strips of lumber to make wider usable stock. A special cold-setting type of glue is used and heat is applied by the radio high frequency method.

33.15. BARNES, J. S. **Making plywood with multi-directional pressure.** *Wood* 8, 1943 (99–102).

A note on the manufacture of moulded plywood, which consists of veneers resin-bonded into shapes on a mould so that the resulting piece of plywood conforms to the shape of the mould. Moulded plywood is used in the making of boat hulls, aircraft parts, etc.

33.15. CALABRO, E. A. (to Polaroid Corp.). **Bonding sheet plastic materials such as cellulose nitrate or acetate to porous, fibrous materials such as wood or paper.** *U.S. Patent* No. 2,294,159, Aug. 25, 1942. Chem. Abstr. 37 (974). P.R.

33.15. FEJÉR, G. **Lamination.** *Wood* 8, 1943 (47–50).

Notes on the use of laminated products in building, furniture manufacture, etc., in Britain.

33.15. JAHRSTORFER, M., and BECK, J. (to General Aniline & Film Corp.). **Water-soluble adhesives obtained by etherifying wood.** *U.S. Patent* No. 2,294,666, Sept. 1, 1942. Chem. Abstr. 37 (976). P.R.

An adhesive is prepared by the reaction of a monohaloacetic acid or a salt of such an acid, such as monochloracetic acid, on comminuted wood with its principal natural components, to render the material treated soluble in water, the comminuted wood being pretreated with an aqueous alkali metal hydroxide such as 35 per cent. NaOH solution.

33.15. JICWOOD, LTD., and FARINA, R. L. J. **Improvements in or relating to the manufacture of resin impregnated compressed wood material.** *British Patent* No. 547,128, 1942. Build Sci. Abstr. 16 (28). P.R.

A method of stabilizing lightly compressed wood material to render it substantially non-absorbent of moisture. The process consists in immersing the wood material, prior to compression, in a bath containing an aqueous solution of synthetic resin or the components thereof.

33.15. KLEMM, H. (to Davis & Co.). **Spreadable cold-setting adhesive suitable for gluing together wood, etc.** *U.S. Patent* No. 2,283,740, May 19, 1942. Chem. Abstr. 36 (6271). P.R.

Use is made of particles of a comminuted *C*-stage synthetic resin, a water-soluble partially reacted cold-setting urea-formaldehyde condensation product in the form of an aqueous glue in a proportion up to about 10 times the amount of the synthetic resin, and a hardening catalyst.

33.15. NARAYANAMURTI, D., and RANGANATHAN, V. **A preliminary note on the use of prolamins as adhesives.** *Indian For. Leafl.* (*Utilisation*) No. 10, 1942, pp. 4. [Forest Research Institute, Dehra Dun.]

Results from the tests reported in this leaflet indicate that plywood adhesives of high strength and water resistance can be developed from alcohol-soluble proteins of *Pennisetum typhoides* and *Zea mays*.

33.15. NORRIS, C. B. **Technique of plywood.** I. F. Laucks, Inc., Seattle. 1942. pp. 249. P.R.

This publication brings together a series of articles previously published in an American journal. The author has been, in turn, with the U.S. Forest Products Laboratory, with a prominent firm of plywood manufacturers, as a consultant in the use of plywood in structures, with I. F. Laucks, Inc., the well-known firm of chemical engineers and glue manufacturers, and is now again with the U.S. Laboratory as a principal engineer.

The early chapters of the book deal with the stability, strength and elasticity of wood and plywood and include much information on elasticity that was previously available only in general form in advanced text books. In the preface the author points out that there has been considerable advance in this subject since the articles were first written, and it is not surprising, therefore, that some of the constants for plywood, notably those relating to its behaviour under shear stresses, are now known to be only very approximate.

Subsequent chapters deal with the manufacture of plywood and related problems; warpage, including the influence of moisture content; and the bending, moulding, and embossing of plywood. A final chapter, on the general scientific principles of gluing, is by I. F. Laucks.

In the chapter on bending, a formula is given for calculating the minimum radius at which the veneer will just break when bent, based on the thickness of the veneer and the moduli of rupture and of elasticity of the wood as determined from the standard beam tests. As minimum radius is a direct function of deflection at maximum load in the beam test, and as this latter property is quite unrelated to those quoted, the justification for this formula is not apparent. As the proportionate increase in modulus of rupture on drying is greater than in modulus of elasticity, the formula necessarily yields greater minimum radii for green than for dry timber, which is contrary to all experience, and, in fact, to the author's own advice on the same page. The minimum radii for Yellow Birch and Sitka Spruce calculated from the formula are approximately twice the values recently determined experimentally at Princes Risborough. In view of the author's experience, these lapses are difficult to comprehend.

J. L.

33.15. PERRY, T. D. **Modern plywood.** Pitman Publishing Corporation, Chicago. 1942. pp. 366. P.R.

Perry is a well-known writer on the technical aspect of plywood, and a high standard is to be expected of a text book bearing his name.

A useful introduction is a seventeen-page glossary of plywood terms, which is followed by the inevitable historical survey of laminated wood. It is surprising to learn that the term plywood did not become a trade name until as recently as 1914–8.

The advantages of plywood as a material are well set out in Section Two and this is followed by a section dealing with the all-important matter of adhesives. This section might well have been amplified, particularly as regards the description of the newer synthetic resin adhesives; there is no mention, for example, of the need for or existence of gap-filling types.

Chapters on the manufacture of veneer and plywood are excellent and amply illustrated; these sections are far more than mere descriptions since they include much data of use to operatives. The new electrostatic heating system is described and there is much on flexible bag--moulding processes. There is an account of experiments in the manufacture of improved wood or high-density plywood, and the section contains some very useful tables of properties.

The uses of plywood in industry are contained in a comprehensive section, covering aircraft, buildings, furniture, ships' fittings, containers, transport vehicles, sports goods, etc.

The remainder of the book contains tabulated data, plywood grading rules and an account of testing methods. There is a fifteen-page bibliography divided into sections corresponding with those in the book, and finally, a really adequate index is provided.

A novel feature of Perry's book is the set of questions at the end of each section. To the student these are invaluable and to the not-so-careful reader, they are sufficiently searching to cause more than slight twinges of conscience.

R. A. G. KNIGHT.

33.15. RENDLE, B. J., and FRANKLIN, G. L. **The identification of plywood glues.** *Repr.* from *J. Soc. chem. Ind.* 62, 1943 (11–4). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

The technique of preparing wood specimens for microscopic examination and identification has been adapted for the investigation of plywood glues. By combining microscopic features and staining reactions with simple physical and chemical tests the principal types of plywood adhesive can be distinguished with a fair degree of accuracy. The investigation deals mainly with animal or hide glues, blood-albumin, casein, soya bean, urea-formaldehyde resins, and phenol-formaldehyde resins. Their distinguishing characteristics are described. *Authors' summary.*

33.15. ROBINSON, T. R. **Plywood.** *U.S. Patent* No 2,291,651, Aug. 4, 1942. Chem. Abstr. 37 (708). P.R.

Various operative details.

33.15 : 01.4. **High frequency plywood bonding.** *Timberman* 44 (3), 1942–43 (56, 58).

In this method of bonding, the plywood is placed between electrodes and high-frequency energy is applied. This creates a high degree of heat within the plywood. It is reported that the capacity of two 300-kilowatt units is equivalent to that of three 15-opening hot-plate presses with automatic loaders. Advantages claimed for this process are noted.

33.15 : 31.27. LOFGREN, E., and CHAMPAGNE, J. **Effect of resin impregnation on impact strength of wood veneers.** *Plastics Trends* 2 (3), 1942 (8). Chem. Abstr. 37 (245). P.R.

33.15 : 33.3. HYLER, J. E. **Methods of bending plywood.** *Veneers & Plywood* 37 (1), 1943 (10–11). P.R.

A brief note on the types of machinery used for bending plywood.

33.15 : 33.8. PERRY, T. D. **The uses of plywood in aircraft.** *Aero Dig.* 41 (1), 1942 (200, 205–6). [Resinous Products & Chemical Co.). L.S.

Outstanding qualities of plywood for aircraft construction include favourable weight/strength ratios, stiffness, ease of moulding, and smoothness of surface; availability of raw materials is a further advantage in the use of the product. The author discusses briefly materials and methods used in modern plywood production and indicates the ways in which this product is being used in aircraft construction.

33.15 : 33.8 : 07.7. ROZEMA, C. E. **West coast woods and aircraft plywood.** *Timberman* 44 (3), 1943 (60, 62, 64, 74). [Resinous Products & Chemical Company.]

The author discusses the standards required in the manufacture of aircraft plywood with reference to materials (wood and adhesives), equipment and methods used.

33.15 : 38.2. **Plywood washers.** *Wood Pres. News* 20, 1942 (130). P.R.

Washers made from scrap plywood $\frac{9}{16}$ in. thick cut into 4-in. squares and bored in the centre for a $\frac{13}{16}$-in. hole were found to be a satisfactory substitute for metal washers in the fabricating of 50-ft. trusses.

33.15 : 38.2. HITCHINS, W. G. **Improvements in or relating to fabricated boards for building construction.** *British Patent* No. 548,416, 1942. Build. Sci. Abstr. 16 (29). P.R.

A sheet or sheets of plain material faced on one or both sides with a sheet of interwoven strip wood.

33.16. Wood-wool (Excelsior) Manufacture

33.16. **Excelsior and its manufacture.** Forest Products Laboratory, Madison, Wis. *Mimeo.* 1941. pp. 3.

Excelsior is used for packing fruit and glassware, in upholstery and mattress making, as kennel and stable bedding, for stuffing toys, etc. The methods and equipment used in its manufacture and the grades in common use are noted briefly. The species most commonly used in the manufacture of excelsior are Aspen and Pine.

33.16 : 38.2. **Wood wool building slabs.** Wood Wool Building Slab Manufacturers Association, 21 St. James's Square, London, S.W.1. [1942?] pp. 18.

The basic qualities of wood wool building slabs are a high degree of sound absorption, resistance to decay and to attack by vermin, and good thermal insulating properties. In tests of fire resistance such slabs have withstood a direct Bunsen flame for periods of from two to five hours without sufficient heat passing through to ignite woodwork at the further face. The slabs are made of wood fibre and a special cement, under pressure. They are tough, elastic, of uniform thickness, and unusually light. The composition of the slabs is such that they do not provide secure holding for nailings, but they will take surfacings of mortar, bitumen, concrete, etc. Instructions are given for the application of plasters, and for the erection of the slabs in various types of constructional work.

33.17. Sawmilling

33.17 : 07.7. BIERMANN, O. Betriebserfahrungen mit dem Vollgatter und ihre Auswertung. [**Practical experiences with frame saws and the application of these experiences.**] *Holz* 5, 1942 (390–7). [G.] P.R.

The deficiencies in saw tension usually found in working with vertical frame saws are the main reason for the widespread use of thick blades, with consequent waste of raw material. Various suggestions are made, based on the author's experience, for overcoming the difficulties attending the use of thin blades.

33.3. *Chemical Treatment*

33.3 ; 33.15. YOUNG, E. S. **Treatment of veneer blocks containing pitch seams to prevent collapse during turning.** *U.S. Patent* No. 2,287,403, June 23, 1942. Chem. Abstr. 37 (248). P.R.

The blocks are subjected to the pitch-dissolving action of a heated fluid, such as steam, and when the pitch seam has been cleared of its pitch it is filled with a supporting material such as glue which is of about the same resistance to cutting as the wood of the block.

33.32. Pulp and Paper Manufacture. Plastics

33.32. **Comparative burning tests of common plastics.** *Plastics* 6, 1942 (207–9, 238). L.S.

33.32. ARIES, R. S., and OTHMER, D. F. **Wood in the chemical industries.** *Timber of Canada* 3 (6), 1943 (25–30, 51).

A popular illustrated account of present-day developments and trends in the chemical utilization of wood, particularly in North America.

33.32. BALL, R. H. **Plastics raw materials: supplies.** *Chem. Engng. News* 21, 1943 (73–6). Brit. Cotton Res. Summ. 23 (181). P.R.

A discussion of tar acid resins and plastics, urea and melamine resins, cellulose ester and ether plastics, acrylate and methacrylate resins, polystyrene and vinyl resins and their uses, particularly war uses, the raw materials used in the production of these plastics, and the supply situation in the United States. It is pointed out that the problem of maintaining supplies of plastics to meet war needs is as much one of insufficient plants for the synthesis of the resins and plastics as of basic chemical shortages.

33.32. LOUGHBOROUGH, W. K. **Plastic wood.** *Agric. News Letter* (*Du Pont*) 9 (6), 1941 (82–6). Biol. Abstr. 17 (6875).

Simple urea treatments are given for solid (green) wood and for sawdust. The resulting product is grey or black, and, in the case of sawdust, difficult to nail. Thermosetting is necessary to prevent bent urea-treated wood from re-softening. Strength qualities are not materially affected by temperatures up to 100° C.

33.32. NICHOLLS, R. V. V. **Plastics and the paper industry.** *Pulp Paper Mag. Can.* 44 (2), 1943 (143–6, 151). [McGill University.]

The subject is discussed under three main headings:—(1) plastics derived from wood; (2) plastics applied to paper and paperboard; (3) plastics for use in paper mills. A list of references from the recent literature is appended.

33.32. URIS. A. W. **Woodpulp plastic products.** *Modern Plastics* 19 (11), 1942 (53–4, 116). *Abstr.* in *Bull. Inst. Paper Chem.* 13 (29). P.O.

Reference is made to a substitute material known generally as a woodpulp plastic and moulded under the name of Tritex. It consists of a cornstarch-rosin binder and a variety of fillers depending on requirements. After the ingredients are mixed they are ready for moulding at temperatures of 300°–350° F., at a pressure of about 400 lb. per sq. in. The material is thermoplastic, and scrap and rejected pieces can be ground and re-used. Uncoated mouldings have the appearance of grainless wood, colour and finish usually being applied in the form of industrial finishes such as lacquer, synthetic enamel, or wood stain.

33.32. WARBURTON-BROWN, D. **Phenol-formaldehyde plastics under conditions of bending fatigue.** *Plastics* 6, 1942 (210–8). L.S.

33.32 : 07.7 : 12.25. DUNCAN, R. D. **Heat of reaction of gaseous sulfur dioxide on moist wood.** *Rapport office recherches sci., Ministère Affaires munic. Ind. com. Province Québec* 1942 (79–82). Chem. Abstr. 37 (255). P.R.

A special calorimeter (not described) was developed to establish the sign and, to some degree at least, the magnitude of the heat effects produced during the process of delignification of moist Spruce wood in a highly concentrated medium of SO_2 gas at 85°–90°. Results are given of a series of measurements made, at 85°, of the heat changes taking place when SO_2 gas reacts with moist wood meal (66 per cent. H_2O), the only variable being the time the reaction was allowed to proceed.

33.32 : 12.25. **New plastic uses Southern Pine.** *Sth. Lumberm.* 166 (2082), 1943 (41).

A description is given of a new type of resin-plastic material known as 'Fedralite' which has been developed by the Patent & Licensing Corporation, New York. A wide variety of fibres including Southern Pine can be used in its manufacture. It is a low-cost material and is expected to have many uses.

33.32 : 12.25 : 98.2 (75.8–9; 76.1–5). WHITE, W. T. **Forest resources of South hold amazing potentialities for industry.** *Paper Tr. J.* 115 (22), 1942 (49–50, 53–4, 56). P.R.

The author discusses the recent development of the pulp and paper industry in the southern United States, its present status and the contribution it is making to improve forest practices in that region. The recent expansion in pulp production in the southern States, which in 1941 was over 43 per cent. of the total for the country as a whole, has made the paper industry in the United States self-contained except for newsprint imports from Canada and Newfoundland. Southern Pines can now be used in the manufacture of any kind of paper made from wood pulp.

33.32 (54) : 12.25–9. BHARGAVA, M. P., and SINGH, S. K. **Manufacture of newsprint, cheap papers and boards.** (Interim report on the investigations carried out at the Forest Research Institute, Dehra Dun.) *Indian For. Bull.* (*n.s.*) *Utilisation* No. 108, 1942. pp. 15 + plate + samples.

Tests have been carried out with material from three species of conifers, seven species of broadleaved trees and three species of Bamboos to determine their use in the manufacture of newsprint, cheap papers and boards. Of the conifers, *Abies pindrow* and *Picea morinda* are suitable for newsprint production, and supplies of these species are said to be sufficient in Kashmir and Tehri-Garhwal States to support a moderate-sized newsprint mill. *Pinus longifolia* saplings are suitable for newsprint production, but supplies are uncertain. Of the broadleaved species, *Broussonetia papyrifera*, *Kydia calycina* and *Excaecaria agallocha* show promise for newsprint production but are not at present available in sufficient quantity to support a newsprint mill. Material from the other four broadleaved species, mature *Pinus longifolia*, and the Bamboo species yielded brown-coloured pulps unsuitable for newsprint production, which could, however, be utilized in small proportions in the manufacture of cheap wrapping papers, duplex boards and triplex boards.

33.32 : 12.26–8. CORRENS, E., and SCHORNING, P. **The manufacture of cellulose of high purity. Beech pulps low in pentosans whose hydrolyzate can be utilized.** *Cellulosechemie* 20 (2), 1942 (29–32). [G.] *Abstr.* in *Bull. Inst. Paper Chem.* 13 (134–5). P.O.

Investigations were carried out to determine suitable conditions for the preparation of pulps from Beech wood with simultaneous utilization of the hemicelluloses by pre-hydrolysis with hydrochloric acid and subsequent sulphate cooking.

33.32 : 12.26–8 : 31.3. JAYME, G., and LOCHMÜLLER-KERLER, E. Über die Wechselbeziehungen zwischen Hemizellulosegehalt und Festigkeit von Zellstoffen aus Buchenholz. **[On the mutual relationships between hemicellulose content and the strength of Beech pulps.]** *Holz* 5, 1942 (377–81). [G.g.] [Institut für Cellulosechemie der Technischen Hochschule Darmstadt.] P.R.

Pulp yields varied with differences in type of mild sulphite cook. After bleaching with sodium chlorite, the pulps were investigated for relationships between strength properties and yields. The investigations confirmed previous results. [Cf. *For. Abstr.* 4 (175).]

33.32 : 12.26–8. SCHAFER, E. R., and PEW, J. C. **The grinding of hardwoods. Studies on Swamp Tupelo, Paper Birch, Green Ash, Sugarberry, Southern Cottonwood, Black Willow, and American Elm.** *Repr.* from *Paper Tr. J.* 116 (4), 1943 (25–32).

Swamp Tupelo (*Nyssa biflora*), if ground soon after cutting, yielded a groundwood pulp that was light coloured and short fibred. While groundwood pulps from this species and Paper Birch (*Betula papyrifera*) were not as strong as pulps made from Spruce, they could be used in appreciable quantities as filler stock in the manufacture of book, magazine and newsprint paper. Pulps made from Green Ash (*Fraxinus pennsylvanica lanceolata*) and Sugarberry (*Celtis laevigata*) were somewhat stronger though not as strong as standard pulp made from Spruce; however, satisfactory newsprint papers were made in which both species constituted a considerable part of the furnish. Groundwood pulps obtained from Southern Cottonwood (*Populus deltoides virginiana*) and Black Willow (*Salix nigra*) were comparable in strength with commercial groundwood. Although the colour of the latter was too dark to permit its use in newsprint or other light coloured papers, it should be suitable for papers and boards in which the dark colour is not objectionable. Groundwood pulp made from American Elm (*Ulmus americana*)

was both short-fibred and dark-coloured, qualities which will limit its use to such products as filler stock for boards and papers where colour is not important. *From authors' summary.*

33.32 : 12.29. TUTIYA, M., and KATO, Y. **Researches on Bamboo in Taiwan as a raw material for pulp. VI.** *J. agric. Soc. Japan* (*Nippon Nôgeikagaku Kaisi*) 17 (8), 1941 (623–6). [Industrial Research Institute, Taityu.] Biol. Abstr. 17 (6892).

33.32 : 31.3. OVERBECK, W., and MÜLLER, H. F. **The hydrolysis of different wood species with water under pressure and the resulting changes of the wood constituents, the lignin in particular.** *Ber.* 75 (5), 1942 (547–54). [G.] *Abstr.* in *Bull. Inst. Paper Chem.* 13 (145). P.O.

33.32 : 31.3 : 12.11.3. WETTSTEIN, W. VON. Züchtungsmöglichkeiten auf höheren Zellulosegehalt. **[Possibilities of breeding with a view to a higher cellulose content.]** *Holz* 5, 1942 (373–5). [G.g.] P.R.

The greatly increased industrial consumption of pulpwood in Germany has placed before tree breeders the task of increasing the annual yield and cellulose content of such wood. For some species, e.g. Poplars, increased growth can be achieved fairly quickly by suitable hybridization and selection. Investigations with one- and two-year old Poplar hybrids indicate considerable growth differences between different strains and within each strain. These differences are thought to give a good indication of the relative value of the plants as far as growth in youth is concerned, which is a substantial help in production on short rotations. Breeding for increased cellulose content is at present rendered difficult by the absence of a simple and reliable method for determining this content from small samples.

33.32 : 33.02 : 12.11.3 : 12.26–8. BRAY, M. W., and PAUL, B. H. **Pulping studies on selected hybrid Poplars.** *Paper Tr. J.* 115 (16), 1942 (33–8). *Abstr.* in *Bull. Inst. Paper Chem.* 13 (115–6). P.O.

The physical properties and the chemical composition of the wood from several elevations in the trunks of 18 hybrid Poplar clones representing 12 parentage classes have been determined at the U.S. Forest Products Laboratory. Clones of the same parentage class were grouped together for pulping tests. Comparison was made of yield and quality of sulphate pulps obtained from the several hybrid poplars and from the wood of *Populus tremuloides*. For further comparison of cooking methods, two samples of the parentage classes were treated by the soda as well as by the sulphate process. The growth rate of the hybrid Poplars was from two to three times as great as that of four species of *Populus* already tested at the Laboratory, while the average specific gravity of the hybrid trees was below all except one of the natural Poplars previously tested. Both the physical and the chemical data indicate a greater variation at different elevations in a single tree than at the same elevation in trees of clones either of the same or of different parentage. Thus it is not possible from these particular data to point out significant differences which might be indicative of either yield or pulp quality. The results of the pulping experiments, however, indicate certain advantages and disadvantages of the hybrid Poplars, both when compared among themselves and when compared with a sample of natural Poplar. Although the hybrid Poplars gave lower yields of pulp (per unit weight of wood) of somewhat higher bleach requirements than were obtained from a sample of natural Poplar (*Populus tremuloides*), the strength properties of the pulps from the former were, in general, superior to those of the latter. The trends indicated may be of value in making selections for further developmental work.

33.32 : 33.02 : 31.23 : 31.1 : 31.3. HÄGGLUND, E. **The influence of wood quality upon yield and quality of sulphite pulp.** *Iva* No. 2, 1942 (77–84). [Sw.] *Abstr.* in *Bull. Inst. Paper Chem.* 13 (173–4). P.O.

From the examination of a number of wood samples a distinct relationship between percentage of summerwood, density, and specific gravity could be observed. Fibre length and, to a lesser degree, fibre width, are, as a rule, largest in the sapwood and smallest in the heartwood, and they decrease towards the top of the tree. In wood samples from the same site, densely grown wood has the longer fibres. The amount of ether extract increases from the centre to the periphery of the trunk. The pentosan content shows the opposite tendency and increases towards the top. The lignin content varies appreciably from tree to tree, but is often fairly constant in the same tree. The samples were digested under conditions which corresponded to those used in industry. The top wood gave about 2 per cent. lower pulp yield than the root wood. There was no noticeable influence due to forest thinning. The mean yield of pulp was largest for the comparatively rapidly grown wood from Skåne (most southern province of Sweden). The heartwood gave a pulp with a higher tearing length and burst strength than the sapwood. The strongest pulp was obtained from the comparatively dense sample from Norrland (a northern province). Variations in yield and quality were found to be independent of the density of the wood.

33.32 : 33.02 : 12.26–8. HOLLAND, W. W. **The substitution of Birch for Spruce-Balsam ground in the newsprint furnish.** *Pulp Paper Mag. Can.* 44 (2), 1943 (148–51). [Quebec North Shore Paper Company.]

Birch wood with an average density of 0·495 and moisture content of 28·5 per cent. produced groundwood pulps with mullen strengths 10 per cent. of normal for Spruce and tear values 15 per cent. of normal with a bulk increase of 45 per cent. Paper machine trials with Birch groundwood as 4 per cent. of the mixed furnish indicated that mullen and tensile strengths and paper smoothness were lowered, while bulk increased. The paper operated well on printing presses but was considered inferior to the regular paper as regards smoothness, transparency and the actual printing. Data from a laboratory project showed that the detrimental effect of these particular Birch groundwoods, as varying percentages of the mixed furnish, was rather more than in direct proportion to the percentage of Birch in the furnish. *From author's summary.*

33.32 : 33.15. DELMONTE, J., and COOKE-DALLIN, M. **Relationships between wood and plastics.** *Timber of Canada* 3 (5), 1943 (24–6, 32). [Plastics Industries Technical Institute, Los Angeles, Calif.]

Brief notes are given on the use of wood flour as a filler in moulding compounds, the use of lignin in the development of plastics, and on the effects of full

resin impregnation on the properties of wood, particularly plywoods.

33.32 : 33.15. GIBSON, A. J. **Wood in the plastics industry.** *Emp. For. J.* 21, 1942 (116–9).

A brief review of some of the literature on this subject.

33.32 : 34.6. KATZEN, R., REYNOLDS, A. O., and OTHMER, D. F. **Plastics from hydrolyzed lignocellulose.** *Modern Plastics* 20 (2), 1942 (91–7, 122, 124). *Abstr.* in *Bull. Inst. Paper Chem.* 13 (114). P.O.

Reference is made to the new continuous process of wood hydrolysis developed by the Northwood Chemical Co. to give lignocellulose for use in plastic moulding compounds. Raw materials for this process include waste wood and a limited amount of sulphuric acid for use as a catalyst.

33.32 : 34.6. MEILER, J. G. (to Marathon Paper Mills Co.). **Treating lignocellulosic material such as wood flour or sawdust for moulding.** *U.S. Patent* No. 2,292,389, Aug. 11, 1942. Chem. Abstr. 37 (700). P.R.

33.32 : 91.7. ARIES, R. S., and KNUDSON, J. I. **Chemical utilisation of wood: source of new raw materials for many industries.** *Chem. Age* 47, 1942 (583–5). O.R.S.

A brief review of developments in the use of wood as a raw material for the chemical industry, e.g. in the production of alcohol, gas fuel, paper pulp, synthetic fibres and plastics, and some minor products. Cellulose is at present the most important chemical constituent of wood from the industrial point of view, but it is expected that in the future lignin will increase in importance as a raw material for plastics.

33.32 : 98.2. **Plastics and timber: a general analysis of plastics as a competitor of, and as an adjunct to timber usage.** *Tech. Leafl. Timb. Devel. Ass.* No. 5, 1943. pp. 4.

33.36. Preservation of Wood. Seasoning and Drying

33.36.1. *Preservation against Attack by Plants and Animals*

33.36.1. **Creosoted wood sewer sound after carrying acid wastes for 17 years.** *Wood Pres. News* 20, 1942 (153–4). P.R.

Pressure-treated lumber, 2 in. × 12 in., having an average retention of about 8 lb. of creosote per cu. ft., was found to be in good condition after 17 years' service in a box sewer used for the discharge of waste containing fruit acids.

33.36.1. HURYCH, A. **Wood petrified with limonite. The use of limonite for the preservation of wooden objects and wood structural work.** *Plyn, Voda Zdravotni Tech.* 20, 1940 (69–70); *Chem. Zentr.* 1940 (II), (1092–3). Chem. Abstr. 36 (5628). P.R.

Spruce and Pine timbers were first impregnated with a dilute solution of limonite, which penetrated deep into the pores of the wood, mineralizing the latter. A thick slurry of the limonite was then applied to the surface. This hardened to a solid, tough, protective layer, which kept the wood from splitting and rotting. It is most satisfactory to impregnate the finished wooden structure, which, if necessary, can subsequently be ground down and polished. The cost of the process is no greater than that of three coatings of oil paint. Limonite is available commercially as a liquid and as a paste.

33.36.1. JORDAN, O. **Protecting wood with synthetic surface coatings.** *Fette u. Seifen* 48, 1941 (433–4). Chem. Abstr. 37 (783). P.R.

33.36.1. KLUND, H. S., and GARDNER, H. A. **Exterior-paint test on preservative-treated woods.** *Circ. nat. Paint, Varnish Lacquer Ass., Sci. Sec.* No. 643, 1942 (219–22). Chem. Abstr. 36 (6023). P.R.

Panels of three species of wood, both sapwood and heartwood, were dipped in a preservative water-repellant solution of pentachlorophenol for 3 minutes. The panels were then drained for periods of 24 up to 336 hours before applying any of the finishes. One-half of the back of each panel was sealed with Al primer and the panels were then painted with two different types of exterior house paint. After 1 year's exposure no pronounced paint failure was observed.

33.36.1. VAUTHERIN, H. M. A. (50 per cent. each to Pierae Schelameur and Yres, E. M. J. de Liniers). **Preserving wood.** *U.S. Patent* No. 2,280,560, April 21, 1942. Chem. Abstr. 36 (5630). P.R.

The wood is placed in a closed, heat-insulated, non-aerated space and heated simultaneously with radiated heat and by direct contact with steam (which contains a mixture of an oily antiseptic substance) applied under pressures ranging from about 3 to 7 kg. per sq. cm. until the temperature of the wood is about 115°–160°. The steam is then shut off and radiated heat continued until the transformed colour of the wood becomes substantially uniform throughout, whereby the elasticity of the wood is increased and a dry non-oily surface is produced.

33.36.1 : 12.25 : 33.53. **Pressure treated Lodgepole Pine poles.** *Wood Pres. News* 21, 1943 (17, 24). P.R.

Lodgepole Pine poles, pressure treated by an empty-cell process with a final retention of 5·5–8 lb. of creosote per cu. ft., showed no decay and no record of removals for decay after 10 years' service in a test line in Colorado.

33.36.1 : 12.25 : 33.53 : 33.31. COLLEY, R. H. **New wood-preservative adaptations for poles and crossarms.** *Abstr.* in *Phytopathology* 33, 1943 (17). [American Phytopathological Society, 34th annual meeting.]

Full-scale commercial experiments have demonstrated that mixtures of creosote, petroleum and pentachlorophenol can be used for pressure treatment of Southern Pine poles and for open-tank treatment of Western Cedar poles and of Douglas Fir, Jack Pine and Norway Pine crossarms. Penetration of above-ground sections of Cedar poles is improved by the removal of sapwood until the sapwood depth is less than $\frac{1}{2}$ in. Full length treatment of poles with salt preservatives may be usefully combined with butt treatment using creosote or creosote solutions. The service life of standing poles can be prolonged by treating the groundline area with sodium fluoride of borax and creosote.

33.36.1 : 12.25 : 33.31. REID, D. **Creosote penetration in Tabonuco wood as affected by preliminary boiling treatments in organic solvents.** *Carib. For.* 4, 1942 (23–34). [E.e.span.] [Duke University School of Forestry.]

Creosote penetration into the very refractory heartwood of *Dacryodes excelsa* was significantly improved by preliminary boiling treatment in kerosene, but the method is considered to be inapplicable on a commercial scale.

33.36.1 : 12.26–8 : 33.31 : 31.43 : 13.2. GREGORY, J. N. **Investigations on the treatment of solid timber with boric**

acid to render it immune from the attack of the powder post borer (*Lyctus brunneus* Stephens). 1.—Laboratory and preliminary investigations. *J. Coun. sci. industr. Res. Aust.* 15, 1942 (233–47). P.R.

The possibility of treating boards of *Lyctus*-susceptible timber by diffusion treatments with hot boric acid solutions was investigated. Three timber species—Red Tulip Oak (*Tarrietia argyrodendron* var. *peralata*), Yellow Carabeen (*Sloanea woollsii*), and White Birch (*Schizomeria ovata*)—were studied and schedules developed to make their normally susceptible wood completely immune to *Lyctus* attack to a depth of 1½ in. Treated boards up to a thickness of 3 in. can thus be sawn or dressed without fear of subsequent attack. Methods for the chemical control of the treatment are described. In appendix I methods are given for determining the concentration of boric acid solutions, and in appendix II are described the methods for the determination of boric acid and borates in timber.

33.36.1 : 31.43 : 13.2. La protection des bois abattus et mis en oeuvre contre les degáts des insectes. **[The protection against damage by insects of wood felled and in service.]** *Ann. Éc. nat. For.* 8 (1), 1941 (133–67). [F.] Biol. Abstr. 17 (7352).

A discussion of preventive and control measures against Cerambycidae, Lymexylonidae, Scolytidae, Platypodidae, Lyctidae, Bostrychidae and Anobiidae.

33.36.1 : 32.26 : 12.25. Buse, R. Versuche über den Einfluss der Lagerungsart osmotierter Hölzer auf die Eindringtiefe des Imprägniersalzes in das Holz. **[Tests on the influence of the method of stacking of preservative-coated timbers on the depth of penetration of the salt into the wood.]** *Holz* 5, 1942 (156–60). [G.g.] P.R.

An account of tests with 7-m. long freshly felled and peeled Pine and Spruce logs which had been given coatings of a chromium-fluorine-arsenic-dinitrophenol mixture with or without an addition of glue. The logs were stored for 4 months (1) in a triangular pile protected with waterproof material, (2) in a triangular pile without protection, or (3) in a single layer without protection. The average penetration depth obtained was (1) 2·5 cm. for Pine and 1·8 cm. for Spruce, (2) 1 cm. for Pine and 0·9 cm. for Spruce, and (3) 0·7 cm. for both Pine and Spruce.

33.36.1 : 33.31 : 31.43. Becker, G., and Schulze, B. Prüfung der insektentötenden Wirkung von Holzschutzmitteln. **[Test of the insecticidal effect of wood preservatives.]** *Wiss. Abh. dtsch. Materialprüf.-Anst.* 1, 1940 (21–30). [G.] *Abstr.* in *Chem. Zbl.* No. 17, 1940 (2412). P.O.

A report on progress in a systematic efficiency test of wood preservatives by the so-called 'Klötzchen' (block) process. The larvae of *Hylotrupes bajulus* L. were used in the test. Detailed information is given on the evaluation of the results.

33.36.1 : 33.31. Böhm, W. Ein Verfahren für die chemische Untersuchung von Holzschutzmitteln, die aus einem Gemisch von Fluoriden mit chrom- und arsensauren Salzen bestehen. **[A process for the chemical investigation of wood preservatives composed of a mixture of fluorides and chromic and arsenic acid salts.]** *Wiss. Abh. dtsch. Materialprüf.-Anst.* 1, 1940 (40–3). [G.] *Abstr.* in *Chem. Zbl.* No. 17, 1940 (2412). P.O.

The process is described in detail.

33.36.1 : 33.31. Harvey, J. E. (50 per cent. to Southern Wood Preserving Co.). **Wood-preserving impregnants from coal-tar constituents, etc.** *U.S. Patent* No. 2,291,295, July 28, 1942. Chem. Abstr. 37 (741–2). P.R.

33.36.1 : 33.31. Harvey, J. E. (50 per cent. to Southern Wood Preserving Co.). **Solvents and wood preservatives from high-temperature coal-tar fractions.** *U.S. Patent* No. 2,291,296, July 28, 1942. Chem. Abstr. 37 (751). P.R.

33.36.1 : 33.31. Harvey, J. E. (50 per cent. to Southern Wood Preserving Co.). **Preservative wood impregnants.** *U.S. Patent* No. 2,291,297, July 28, 1942. Chem. Abstr. 37 (740). P.R.

A preservative impregnant is prepared by a process which involves subjecting a mixture of tar fractions to the action of H in the presence of H_2S and a sulphide catalyst with time, temperature and pressure so controlled as to induce new low-boiling fractions with consequent reduction in rate of the synthesis; stripping from the treated material newly induced low-boiling material to produce a residual with an initial boiling point in the range of about 250°–270°; continuing reaction conditions on the stripped residual with resultant at least partial restoration of the rate of such synthesis, and with time, temperature and pressure so controlled as to convert the residual material into an oil of the wood-preserving type which if relieved of a percentage of its low-boiling fractions will have no greater percentage of materials distilling below a given temperature nor between the initial point and a given temperature than is permitted by specifications accepted in the trade for a tar-derived wood preservative and being further characterized by a substantial residual above 300°, and relieving the treated residual of that percentage of low-boiling materials to provide specification conformance as mentioned.

33.36.1 : 33.31. Harvey, J. E. (50 per cent. to Southern Wood Preserving Co.). **Improving the toxicity of coal-tar-fraction material, as for use in wood preserving.** *U.S. Patent* No. 2,291,301, July 28, 1942. Chem. Abstr. 37 (740). P.R.

33.36.1 : 33.31. Harvey, J. E. **Solvents and wood preservatives from sulfur-bearing high-temperature coal-tar fractions.** *U.S. Patent* No. 2,291,304, July 28, 1942. Chem. Abstr. 37 (752). P.R.

33.36.1 : 33.31. Harvey, J. E. (50 per cent. to Southern Wood Preserving Co.). **Catalytic production of wood-preservative materials from coal-tar fractions.** *U.S. Patent* No. 2,291,321, July 28, 1942. Chem. Abstr. 37 (740). P.R.

33.36.1 : 33.31. Harvey, J. E. (50 per cent. to Southern Wood Preserving Co.). **Material for impregnating and preserving wood.** *U.S. Patent* No. 2,291,324, July 28, 1942. Chem. Abstr. 37 (739). P.R.

An impregnating material is produced by subjecting a mixture of high-temperature coal-tar fractions to the action of a flow of H of about 12,000–18,000 cu. ft. per bbl. of material treated in the presence of Mo sulphide and Sn chloride as catalysts, at a temperature of 400° or higher and a pressure above 200 atm., to produce a 'beneficiated' material of induced toxic properties, the time of treatment being such as to produce a material, which if distilled up to a temperature to provide a distillate as an oil of the wood-preserving type will

produce an oil of such type of which not more than about 10 per cent. will distil at 210° and not less than about 45 per cent. will distil at 355°

33.36.1 : 33.31. HARVEY, J. E. (50 per cent. to Southern Wood Preserving Co.). **Wood preservatives from coal-tar fractions.** *U.S. Patent* No. 2,291,329, July 28, 1942. Chem. Abstr. 37 (740–1). P.R.

33.36.1 : 33.31. HARVEY, J. E. (50 per cent. to Southern Wood Preserving Co.). **Wood impregnants from coal-tar fractions.** *U.S. Patent* No. 2,291,334, July 28, 1942. Chem. Abstr. 37 (741). P.R.

33.36.1 : 33.31. HARVEY, J. E. (50 per cent. to Southern Wood Preserving Co.). **A wood-impregnating material from coal-tar creosote.** *U.S. Patent* No. 2,291,336, July 28, 1942. Chem. Abstr. 37 (742). P.R.

33.36.1 : 33.31. LEWIS, A. J. **Gloss retention and wood protection merits of phenolic resin-soybean oil varnishes.** *Paint Oil Chem. Rev.* 104 (2), 1942 (7–8). [U.S. Regional Soybean Industrial Products Laboratory, Urbana, Illinois.] L.S.

33.36.1 : 33.31. MORWAY, A. J., and MILLER, F. L. (to Jasco, Inc.). **Halogenated hydrocarbon products suitable for use with wax in impregnating wood, etc.** *U.S. Patent* No. 2,291,403, July 28, 1942. Chem. Abstr. 37 (740). P.R.

33.36.1 : 33.31. OEFFINGER, E. F., and STAUFFER, H. G. (to E. I. du Pont de Nemours & Co.). **Finishing compositions suitable for use on wood or metal surfaces, etc.** *U.S. Patent* No. 2,292,468, Aug. 11, 1942. Chem. Abstr. 37 (784). P.R.

33.36.1 : 33.31. PERKINS, H. C. (to The Western Union Telegraph Co.). **Wood-preserving compositions.** *U.S. Patent* No. 2,296,401, Sept. 22, 1942. Chem. Abstr. 37 (1240). P.R.

A mixture of creosote and paraffin is used with at least one of the compounds NaF, As_2O_3, dinitrophenol, $ZnCl_2$ or $K_2Cr_2O_7$, with use of the paraffin in sufficient proportion to maintain the desired quantity of the specified toxic compounds in thoroughly dispersed form.

33.36.1 : 33.31 : 31.42.12. VERRALL, A. F. **Sap stain chemicals for emergency use.** *Sth. Lumberm.* 166 (2085), 1943 (64–5).

Results of small-scale sap-stain control tests using Lignosan (containing ethyl mercury phosphate), Dowicide G (sodium pentachlorphenate), borax, soda, and various combinations of these substances. The tests, which are not conclusive in themselves, are described with reference to past experience. Some of the mixtures investigated appear to be as effective as the standard solutions in present use while allowing of an economy in materials of which there is a shortage, but as yet there is no conclusive proof of their value.

33.36.1 : 33.52 : 31.41 : 12.26–8 : 12.25. **Report of 33rd annual inspection of C., B. & Q.R.R. experimental ties.** *Wood Pres. News* 21, 1943 (1–4). P.R.

33.36.1 : 33.53 : 12.25. **Salvaged, redriven creosoted piles in good condition after 25 years.** *Wood Pres. News* 21, 1943 (11–2). P.R.

The piles were of Southern Yellow Pine originally pressure treated with a final retention of 16 lb. of creosote per cu. ft.

33.36.1 : 33.53 : 12 25 : 33.31. HILL, C. M. **Greensalt preservative for telephone poles.** *Bell. Lab. Rec.* 21, 1942 (62–5). L.S.

Laboratory and field tests have been made to determine the value of Greensalt as a wood preservative. Results indicate that wood which retains an over-all concentration of 1 lb. of the preservative per cu. ft. is highly resistant to decay and insect attack. [Cf. *For. Abstr.* 4 (177, 178).]

33.36.1 : 33.54 : 31.43 : 13.2. NEETLES, W. C. **Treating fence posts with chromated zinc chloride.** *Agric. News Letter* 10 (3), 1942 (65–6). Biol. Abstr. 17 (3194).

Particularly with reference to protection against subterranean termites. Directions are given for treating posts, together with tables for determining the amount of solution required, based on the diameter of the posts. Posts so treated are sound after 4 years.

33.36.1 : 33.54 : 12.26–8. WIMBUSH, S. H. **Preservative treatment of *Eucalyptus* fence posts.** *E. Afr. agric. J.* 8, 1943 (182).

While untreated fence posts of *Eucalyptus globulus* and *E. saligna* were no longer serviceable after 3 years in the ground due to termite attack and those of *E. citriodora* were unserviceable after 5 years, posts that had been treated with a 2-per-cent. solution of Wolman salts (Tanalith U) were in good condition after 7 and 10 years' service, respectively. Posts that were allowed to season for three months before treatment gave better service than those that were treated immediately after felling. Details are given for the open-tank method of treatment used.

33.36.2. *Fireproofing*

33.36.2. DRÖGSLER, O. **Testing fireproofing agents.** *Bautenschutz* 13 (4; 5), 1942 (25–32; 33–40). Build. Sci. Abstr. 16 (n.s.) (119). P.R.

Reference is made to the method of testing fireproofing material for wood prescribed in the revision of the German specification DIN 4102. On the basis of experimental data obtained in different institutes from tests of treated battens and crates the author examines the various sources of error. Determination is made of the variation in the following:—dimensions and weight of the test body, moisture content of wood, absorption of the fireproofing material by the wood, rate of burning, temperature reached, etc. [Cf. *For. Abstr.* 4 (179).]

33.36.3. *Seasoning. Drying*

33.36.3. TONEY, W. (to Crossett Lumber Co.) **Artificial seasoning of lumber.** *U.S. Patent* No. 2,296,546, Sept. 22, 1942. Chem. Abstr. 37 (1240). P.R.

Apparatus is described, and a method is employed which involves stacking in charges and subjecting each charge to live steam under low pressure, insufficient to remove the resinous constituents and injure the wood, for a time sufficient to heat and soften the wood followed by reducing the pressure to vaporize internal constituents of the wood at a higher temperature than that corresponding to the steam at the reduced pressure, the temperature ranging from above to below that of boiling water at atmospheric pressure, until at least 20 per cent. of the vaporizable constituents have been expelled removing the vaporized constituents of the wood and surface moisture partially to dry it, and subjecting the heated charge to combined heat and moisture in a circulating atmosphere of controlled humidity and

temperature in successive stages of decreasing humidity and increasing temperature for periods of time sufficient to vaporize successive decreasing increments of internal moisture whereby substantially 60 per cent. more of the originally vaporizable constituents of the charge are vaporized and expelled, the entire series of treatments being carried out as a continuous process and completed in not more than 30 hours for lumber over 1 in. in thickness.

33.36.3. TOUSLEY, F. J. **Kiln drying as practised at the plant of the Oregon-American Lumber Corporation, Vernonia, Oregon.** *W. Cst. Lumberm.* 69 (12), 1942 (18, 47–8).

The equipment is described and kiln-drying schedules that have produced best results are given for 1- and 2-in. Douglas Fir common and B&B stock.

33.36.3 : 33.4 : 31.22.1. VOORHIES, G. **Instructions for air seasoning lumber and sawed products.** *Leafl. Ore. Sch. For.* No. 1, 1941. pp. 5.

General rules are listed for laying out the drying yard and timber piles, for piling the timber and for evaluating the factors that influence rate of drying. Instructions are given for determining the moisture content of wood by oven-drying and weighing.

33.36.3 : 33.51 : 31.22.3 : 32.25.5. GUILLEBAUD, W. H. **Investigation on the rate of drying of pit-props.** *Forestry* 16, 1942 (13–31).

The investigations were carried out in three series during 1940 and 1941, the first series being started in January–February, 1940, in the Forest of Dean, the second in May–June, 1940, in 9 separate localities in Great Britain, and the third from October, 1940, into 1941, in 10 separate localities. Species tested included Scots Pine, Norway Spruce, Sitka Spruce, European Larch and Douglas Fir. Tests were carried out on peeled and unpeeled props, and information was obtained on the influence of size of props on rate of seasoning, and on the average number per ton of props of different species and sizes when freshly prepared and after peeling, stacking and seasoning.

Rate of drying was shown to be greatly affected by the time of year at which props were prepared, drying being most rapid in the summer, somewhat slower in the winter, and very gradual for those started in the autumn. Props prepared and carefully stacked during the period from the middle of April to the middle of September, in the warmer parts of the country, may be expected to lose 75 to 80 per cent. of free moisture within a month of stacking and to become approximately air-dry within 8–10 weeks. Peeling the bark before stacking results in an immediate loss in weight of 8–13 per cent. and an increase in rate of drying. This effect varies considerably with the species. It is concluded that the principal and possibly the only advantage gained by peeling and stacking pitprops is the reduction in haulage and freight charges.

33.36.3 : 33.8. ŠVORC, J. Die künstliche Trocknung von Rohteilen für Holzschuhe. [**The kiln-seasoning of parts for wooden shoes.**] *Holz* 5, 1942 (381–90). [G.g.] P.R.

33.37. Distillation. Manufacture of Tar

33.37 : 33.39. WEGELIUS, T. **The manufacture of liquid fuel and lubricants from wood conversion products.** *Finnish Paper Timber J.* 24 (7A), 1942 (62–8). *Abstr.* in *Bull. Inst. Paper Chem.* 13 (144). P.O.

In the refining of wood tar, consideration should be given to those methods which aim at the utilization of the phenols. The process by Fischer-Tropsch is fully developed technically, but under present conditions not commercially feasible. Good results can be obtained by hydrogenation, but the necessary installations are expensive. In the United States selective extraction with suitable solvents has become of great importance in the separation of valuable wood products. The raw methanol from wood carbonization is a valuable motor car fuel. The manufacture of pulp gives a number of by-products which can be used as liquid fuel, such as turpentine, methanol, liquid rosin (?). In Finland sufficient quantities of sulphite alcohol have not yet been produced, but it is probable that the direct saccharification of wood or wood pulp will lead to the production of a suitable fuel. Mixtures of aliphatic alcohols, ethers, and ketones prepared from sulphate black liquor or from wood or wood pulp by catalysis have produced a satisfactory motor fuel for aeroplanes. Peat may prove a most important raw material for destructive distillation. Peat tar is better for hydrogenation than coal tar, because it is richer in valuable phenols and, in addition, contains paraffin-like substances.

33.38. Charcoal Manufacture. Use of Wood and Charcoal in Producer-Gas Generators

33.38 (71.4). RISI, J. L'industrie de la carbonisation du bois dans la Province de Québec. [**The wood carbonization industry in the Province of Quebec.**] *Bull. Serv. for. Québec* No. 3, 1942. pp. XVI + 144 + tables. [F.]

Includes data on the properties, manufacture, and uses of charcoal in Quebec, with recommendations for increasing charcoal manufacture.

33.38.1. LOSEBY, P. J. A., and MERWE, C. C. VAN DER. **Modern methods of wood charcoal manufacture.** *J. S. Afr. For. Ass.* No. 9, 1942 (31–43 + dgms.]

An account is given of the uses, the principles of manufacture, and the crushing and grading of charcoal, with detailed descriptions of various new types and sizes of kilns and pits, and information on the selection and preparation of wood used in its manufacture. *From authors' summary.*

33.38.1 : 07.7. CHATURVEDI, M. D. **The Chinese charcoal kiln.** *Indian For.* 69, 1943 (75–9 + plate).

The kiln consists of a rectangular ditch measuring 12 × 5 × 6 ft. covered with iron sheets, the joints being made airproof by the use of dry fine earth. Carbonization is regulated by a system of flues and exhausts. Operational data for this kiln show that it requires about 48 hours for carbonization, 30 hours for cooling, and the yield of charcoal from green, freshly cut wood averages about 18 per cent. In comparison with the paraboloid-type kiln, the Chinese kiln is simpler to construct and easier to operate, more portable, gives more rapid carbonization, is easier for loading and extraction of charcoal and costs less to operate.

33.38.1 : 07.7. HARRIS, F. **A charcoal kiln of brick construction.** *Emp. For. J.* 21, 1942 (110–5 + plate). [Forest Products Research Laboratory, Princes Risborough.]

An illustrated account of the construction of the kiln is followed by details of the charging and burning operations. The design is based on that of the Forest

Products Research Laboratory portable kiln [cf. *For. Abstr.* 4 (241)] and the materials used are ordinary builders' bricks bonded in lime–sand mortar. Carbonization is completed in about 20–24 hours. Advantages of this type of kiln are cheapness and ease of construction, and production of good quality charcoal; disadvantages include lack of portability, a slight tendency for the mortar to crack and a rather prolonged cooling period which may be two days or even more.

33.38.1 : 12.26–8. FEDEROV, L. E., IVAKIN, I. A., and EFREMOVA, G. I. **The sorption properties of Birch charcoal obtained by double burning.** *Sborn. Nauch. Issledovatel. Rabot Ural. Otdeleniya vsesoyuz. teplotech. Inst.* No. 6, 1939 (69–76). *Khim. Referat Zhur.* No. 9, 1940 (87). Chem. Abstr. 37 (744). P.R.

The activity and the yield of charcoal were improved by heating to 400°. Aqueous solutions of I, PhOH and NH_3 were used to determine the absorptive power of the charcoal. Birch charcoal obtained by double burning is less expensive to produce than activated charcoal and the absorptive properties of the two charcoals are much the same. In semi-plant experiments, the product was satisfactory for dephenolizing waste waters from brown-coal gas generators.

33.38.1 : 12.26–8 (946) : 34.23. JAEGER, J. C. **The ash content of charcoal from some Tasmanian timbers.** *Aust. J. Sci.* 4, 1941 (45–7). [University of Tasmania.] A.P.B.

Tests were made to determine the ash content of charcoal produced by retort carbonization under standard conditions from small pieces of timber of different species, from different trees and from various parts of the tree. Results showed that the ash content of wood from the outer layers of the tree is high, but that it falls sharply to a constant value for wood from the interior of the tree. No large variations were found in the ash content of the heartwood of the same species, even if taken from trees grown in quite different localities. The ash content of the outer layers of green wood is usually rather higher than that of dry wood, but for the interior layers the difference is small. The ash content of unsound wood does not differ materially from that of sound wood. That of the bark is comparatively high, normally ranging from 5 to 20 per cent. The woods used in the test were mainly *Eucalyptus*, *Acacia* and *Casuarina* species.

33.38.2. RAMASWAMI, S., and DEY, A. C. **Formation of clinker in producer-gas plant.** *Indian For. Leafl.* (*Chemistry and Minor Forest Products*) No. 30, 1942. pp. 4 + plate.

Clinker formation has been found to be due to earthy impurities commonly found in charcoal made in indigenous mud kilns or pits. When these impurities are removed (by sinking them in water or by careful hand picking), clinker formation is completely avoided. The amount and nature of the ash in the charcoal is not the main cause of clinker formation. *Authors' summary.*

33.38.2 (73). **Wood charcoal gas as a motor truck fuel.** *Timberman* 44 (5), 1942–43 (14–5).

A brief note on gas producers, their design and fuel requirements, with particular reference to tests that have been carried out at the U.S. Forest Products Laboratory.

33.38.2 (94). AUSTRALIA. **Australian standard specification (emergency series). Wood charcoal for use in gas producers for vehicles and tractors.** *Emergency Standard* (E) 2D. 3002–1942, (revised ed.) 1942. pp. 6. Standards Association of Australia, Science House, Gloucester and Essex Streets, Sydney. P.R.

Information is given in three parts as follows:—part I—the specification; part II—information on the testing of charcoal, including the preparation of test samples, the determination of hardness, moisture content, volatile matter, potential tar, ash, calorific value and reactivity, and presentation of test results; part III—information on sample field tests including those for cleanness, volatiles and tar, moisture content and decrepitation.

33.38.2 (94) : 07.7. AUSTRALIA. **Australian Standard specification (emergency series) for charcoal gas producers for motor vehicles together with Australian standard rules (emergency series) for the testing of charcoal gas producers for motor vehicles.** *Emergency Standard* No. (E) 2D. 3001–1942 and *Emergency Code* No. (E) CD.1–1942, (revised ed.) 1942. pp. 32. Standards Association of Australia, Science House, Gloucester and Essex Streets, Sydney. P.R.

33.38.2 (943). **The manufacture of charcoal for producer gas vehicles.** *Bull. Qd. Govt. Producer Gas Comm.* No. 7, 1942. pp. 19. P.R.

This bulletin gives general information that is applicable to Queensland conditions. Topics dealt with include timber species suitable for charcoal and methods of charcoal burning. The construction and operation of the Queensland Forest Service vented pit are described in detail. With this unit, which is cheap to construct, it is possible to manufacture charcoal of very good quality.

33.38.2 (943). **Producer gas in Queensland as a substitute for petrol.** *Bull. Qd. Govt. Producer Gas Comm.* No. 6, 1942. pp. 28. P.R.

This pamphlet gives general information and advice on producers and charcoal fuels to users and prospective users of portable units in Queensland.

33.38.2 : 32.91.22. GODWIN, G. **Application of producer gas to Canadian automotive transport.** *Pulp. Paper Mag. Can.* 44, 1943 (273–8, 282).

A general discussion on the use of portable producers. It is thought that mobile producers operated with forest fuels may eventually find a permanent place in Canadian woodlands operations.

33.39. Manufacture of Sugar, Oils, Alcohol, and Vinegar from Wood

33.39. Mindre sulfitsprit. [**Less sulphite spirit.**] *Svensk. PappTidn.* 46, 1943 (137). [Sw.] A.P.B.

A considerable reduction in the demand for fodder cellulose below that which had been estimated, mainly as a result of the fairly good crops of coarse fodder in the autumn of 1942, has reacted on the manufacture of sulphite spirit. There are at present in Sweden 33 sulphite spirit distilleries with a capacity of about 75 million litres of spirit per year. It would appear as though this capacity will be only partially utilized.

33.39. GUINOT, H. M. **Saccharification of wood for the production of alcohol.** *Chim. et Industr.* 46, 1941 (283–90). Chem. Abstr. 36 (6013). P.R.

33.39 (485). **Artificial rubber from wood is planned.** *Paper Tr. J.* 115 (20), 1942 (8). P.R.

A new process for the manufacture of an artificial rubber from wood products is reported from Sweden. The product, known as 'Telax', is capable of being vulcanized and is suitable for use in bicycle tires, shoe heels and plastic products, but not for motor car tyres.

33.6. *Packing Boxes, Crates, etc.*

33.6. **Collapsible packing cases.** *Timb. Tr. J.* 165, 1943 (196).

With reference to packing cases designed by the Imperial Tobacco Co., Ltd., which after unpacking can be dismantled and shipped back to the place of origin for further use.

33.6 : 07.7. EMMETT, J. A. **Box and basket factory equipment.** *Veneers & Plywood* 37 (2), 1943 (10–11). P.R.

33.6 : 33.15. MOHAMMAD, S. **Plywood containers.** *Indian For. Leafl.* (*Utilisation*) No. 24, 1942. pp. 4 + plates. [Forest Research Institute, Dehra Dun.]

Details are given for the manufacture of plywood drums used for holding grease, oils, paints, medical stores and drygoods, and include a formula for the casein cement used in this work.

33.7. *Firewood*

33.7 : 07.7. **Wood as emergency fuel.** *For. Leaves* 32 (6), 1942 (5–7).

Although fuelwood in the forest is relatively cheap and compares favourably with other types of fuel in heat value (data are given for 12 species), the cost of burning wood is in many cases excessive owing to antiquated methods of logging and distribution and to the low efficiency of old-fashioned types of wood stove. The economic utilization of cordwood depends largely on the use of improved types of wood-burning stoves, several of which are described. Suggestions are also made for adapting furnaces to the use of wood fuel.

33.7 : 07.7. WILLEY, E. C. **Saving fuel in Oregon homes.** *Circ. Ore. Engng. Exp. Sta.* No. 7, 1942. pp. 33.

The efficiency of domestic heating as affected by conditions of insulation, heating systems, fuels, etc., is discussed. Data are given on the heating value of local wood fuels and recommendations are made on the use of wood-burning equipment.

33.7 : 12.26–8 (66.9). NIGERIA. **Annual report on forest administration for the year 1941.** Forest Department, Ibadan. [1942?] pp. 19.

Tests have shown that the species *Bosquiea angolensis*, *Sterculia rhinopetala*, *Oricia* sp. and *Trichilia* sp. are suitable as fuel for maintaining steam in the power plant at Ibadan though none of them has proved to be as good as Teak (p. 12).

33.7 : 33.36.3. LUNDBERG, H. **The wood fuel drying problems.** *Svensk PappTidn.* 44, 1941 (495–8). [Sw.] Chem. Abstr. 36 (6776). P.R.

An introduction to a symposium on different methods and equipment available for drying wood fuel. The fundamental principles of the problem are discussed and the efficiency theoretically obtainable with flue and waste gases is given.

33.8. *Other Manufactured Products*

33.8. MÖLL, H. Holz als Baustoff für Rohrbrunnenfilter. **[Wood as a building material for well filters.]** *Holz* 5, 1942 (350–3). [G.g.] P.R.

In general, past experience has shown that wooden well filters are quite satisfactory.

33.8. STOLZ, E. Neuzeitliche Herstellung von Gewehrschäften. **[Modern manufacture of rifle stocks.]** *Holz* 5, 1942 (353–7). [G.] [Heereswaffenamt.] P.R.

Illustrated notes on German manufacturing practices.

33.8 : 12.26–8. BELANI, E. Buchenholz beim Bau elektrischer Sammer. **[Beech wood in the construction of accumulators.]** *Holz* 5, 1942 (163–5). [G.] P.R.

Notes on the use of Beech wood as a substitute for vulcanite in the making of battery separators.

34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

34.2. *Vegetable Products*

34.24. Tanning Materials. Cork

34.24 (73). COOKE, G. B. **Towards self-sufficiency in cork.** *Chem. Engng. News* 20, 1942 (956–7). [Research Department, The Crown Cork and Seal Co., Baltimore, Md.] L.S.

Exhaustive tests have shown that California cork is equal in quality to the Mediterranean product and may be used interchangeably with it. Factory-grinding tests with 1-ton batches showed a yield of 60 per cent. of usable cork. Plans are being made to extend the cork-growing programme both in California and in the southern States.

34.24 : 12.25. FRIEDMAN, L., and EZELL, A. I. **Composition cork from Douglas Fir.** *Timberman* 44 (4), 1942–43 (14–6, 54–5). [Oregon Forest Products Research Laboratory, Corvallis.]

[Cf. *For. Abstr.* 4 (184).] The method of treating Douglas Fir bark to obtain cork granules of the required size, purity and moisture content for the manufacture of composition cork is described briefly. The granules are bonded with a synthetic resin (normally 4 parts resin and 6 parts plasticizer) and the resulting product compares favourably with Spanish cork in compressibility and resilience. Experiments have shown that by varying the resin and plasticizer content a considerable range in variations of these qualities can be obtained. The heat conductivity of composition bark is about twice that of an equal thickness of Spanish cork and about one-half that of an equal thickness of solid wood. Cork from Douglas Fir will absorb more water from air at 100 per cent. relative humidity than will Spanish cork and requires longer to reach equilibrium. Bark on the stumps of Douglas Fir has been found to be particularly rich in cork.

34.25. Christmas Trees. Medicinal Plants

34.25 (54). CAIUS, J. F. **The medicinal and poisonous plants of India: Dammers, Guttifers, Silk-cottons, Teas, Tutsans, Waterpeppers.** *J. Bombay nat. Hist. Soc.* 42, 1941 (617–39). Li. U.

34.25 : 12.25 : 12.11.11 : 12.14.5. SCHEUNERT, A., and RESCHKE, J. **A decoction of conifer needles as a source of vitamin C.** *Klin. Wochschr.* 19, 1940 (976–9). [G.] Chem. Abstr. 36 (6747). P.R.

Conifer needles of various species contain on an average large amounts of vitamin C, which vary between 50 and 250 mg. per cent. Upon storage the vitamin C content of the needles diminishes; considerable losses occur on prolonged storage. About 50 per cent. of the

vitamin C in Pine and Spruce needles, but only about one-third in the harder Silver Fir needles, can be extracted by boiling with water.

34.25 : 12.26–8. DUNN, L. **Cascara.** *Leafl. Ore. Sch. For.* No. 3, 1942. pp. 10.

A brief note on the Cascara Buckthorn (*Rhamnus purshiana*), including a description of the tree and information on its silvicultural characteristics and requirements, the factors influencing its artificial regeneration, its history and distribution, and its use in medicinal preparations.

34.26. Resin. Gums. Turpentine. Oils. Rubber. Latex. Dyestuffs. Sugar

34.26. MARTIN, R. W. **Resin from Pine wood.** *U.S. Patent* No. 2,287,351, June 23, 1942. Chem. Abstr. 37 (274). P.R.

A pulverulent free-flowing resin, which is substantially insoluble in light petroleum hydrocarbons is obtained from Pine wood by extracting the wood with an organic solvent which dissolves the normally solid resinous materials and terpene oils present in the wood, separating the extract from the wood, evaporating from the extract the solvent and other volatile portions to produce a solid residue, treating the residue with a substantially saturated low-boiling paraffin hydrocarbon in liquid state at a temperature below that at which the insoluble particles of the residue soften to dissolve substantially all the rosin and to leave an insoluble residue in a finely divided form and recovering this insoluble residue, which, after drying, is in a pulverulent and free-flowing condition, having the specified character. U.S. 2,287,352 relates to a method for directly producing a resin which is substantially insoluble in light petroleum hydrocarbons. It includes extracting Pine wood with toluene, the extract containing the normally solid resinous materials and terpene oils present in the wood, diluting the toluene extract with pentane in an amount sufficient to precipitate that portion of the resinous materials from the toluene extract which is substantially insoluble in pentane, separating such insoluble portion from the solution and drying the residue.

34.26 : 01.4. LISTER, D. A. (to Hercules Powder Co.). **Refining Pine oleoresin with oxalic acid.** *U.S. Patent* No. 2,293,514, Aug. 18, 1942. Chem. Abstr. 37 (1054). P.R.

A process is employed for producing a high-grade, pale rosin from crude Pine oleoresin which has not been previously heated to a materially elevated temperature, which comprises dissolving the oleoresin in a volatile organic solvent and forming therein a solution essentially free from aqueous phase, dirt, etc., treating the solution with a chemical refining agent consisting essentially of oxalic acid, and evaporating volatile matter from the treated solution to leave a residue of purified, high-grade rosin.

34.26 : 12.26–8 (54.8). RANGASWAMI, S. **A study of the gum of *Acacia arabica* produced in S. India.** *Indian J. Pharm.* 4, 1942 (128–31). [Andhra University, Waltair.] L.S.

For pharmaceutical purposes the gum of *A. arabica* is generally considered inferior to that of *A. senegal*, chiefly on account of its dark colour and the presence of impurities. Examination of samples of *A. arabica* from the Kistna district of the Madras Presidency showed, however, that with a little attention the Indian gum can be made to serve the requirements of pharmacy very satisfactorily. It passes the tests for purity laid down in the British Pharmacopoeia except in the matter of optical rotation, a point which may not be of great significance. Moreoever, the mucilage of *A. arabica* was found to be much more viscous than the corresponding mucilage prepared from a sample of B.P. Acacia.

34.26 : 01.4. JENNINGS, W. H. **Refining sulfate wood turpentine.** *U.S. Patent* No. 2,283,067, May 12, 1942. Chem. Abstr. 36 (6364). P.R.

A process is employed for refining wood sulphate turpentine containing sulphur compounds as an impurity which involves heating the turpentine with an aqueous solution of NaOH and lime without substantially vaporizing the turpentine itself to effect substantial removal of such impurities from the turpentine, separating the aqueous solution from the turpentine, and thereafter steam-distilling the turpentine and recovering a purified turpentine distillate. An arrangement of apparatus is described.

34.26 (54). APPAJI RAO, P. **Position of essential oil and perfumery trade in India.** *Sci. & Cult.* 6, 1940–41 (710–8). L.S.

34.26 (54.1). BAL, S. N. **Essential oil yielding plants of Bengal.** *Indian J. Pharm.* 4, 1942 (119–23). L.S.

It is suggested that the difficulty of importing essential oils at the present time affords Bengal an opportunity to regain her former pre-eminence in the manufacture and export of perfumes by the increased cultivation of essential oil-yielding plants. Two lists are given, one of indigenous or naturalized oil-producing species, and the other of some exotic species which may prove of value.

34.26 : 12.25. BORGLIN, J. N. (to Hercules Powder Co.). **Pine-oil compositions suitable for use as parasiticides or cleansing agents, etc.** *U.S. Patent* No. 2,291,205. July 28, 1942. Chem. Abstr. 37 (709). P.R.

34.26 : 12.26–8 (729.5). ARRILLAGA, N. G. **Leaves of *Eucalyptus citriodora* yielded 1·3 per cent. oil.** *Annu. Rep. Puerto Rico agric. Exp. Sta. 1939*, 1940 (39–40). Chem. Abstr. 36 (5615). P.R.

Steam distillation of leaves from trees of *E. citriodora* grown in Puerto Rico gave a yield of 1·3 per cent. oil containing 78·42 per cent. citronellal. The yield of oil is nearly double that reported from other countries, although foreign oils showed a content of citronellal (by acetylation) of 80–90 per cent.

34.26 : 12.26–8. BERRY, P. A., and SWANSON, T. B. **A note on the essential oil of *Eucalyptus conglobata* var. *anceps*.** *J. roy. Soc. N.S.W.* 76, pt. I, 1942 (53–4). O.R.S.

The oil from the growing tips of this species consists principally of cineol (58 per cent.) and pinene, with a small proportion of alcohols, aldehydes and ketones. *Authors' summary.*

34.26 : 12.26–8. BLACKMON, G. H. **The Tung-oil industry.** *Bot. Rev.* 9, 1943 (1–40). [University of Florida Agricultural Exp. Sta., Gainesville.]

In the United States.

34.26 : 12.26–8. CASTILLO, V. A. *Eucalyptus.* Contribución al conocimiento del eucalipto y de sus esencias, en la Provincia del Tungurahua. [***Eucalyptus***

Contribution to the knowledge of *Eucalyptus* and its essential oils, in the Province of Tungurahua.] *Bol. Ecuador Univ. Cent. Inst. Bot.* 1 (1), 1942 (125–59). [Span.] U.S.D.A. Bibliog. (Plant Science) 1 (D–168).

34.26 : 12.26–8 (94). GUENTHER, E. **Australian *Eucalyptus* oils.** *Drug & Cosmetic Ind.* 51, 1942 (160–7, 203; 281–5; 404–9). L.S.

According to their chemical composition *Eucalyptus* oils can be divided into three groups:

(1) Pharmaceutical or medicinal oils, in which the main constituent is cineol, in the proportion of about 70 per cent. The chief species producing this type of oil are *Eucalyptus polybractea* (cineol content 80–85 per cent.), *E. australiana*, *E. dives* var. 'C', *E. leucoxylon*, *E. sideroxylon*, *E. elaeophora*, *E. viridis*, *E. cneorifolia*, *E. globulus*, and *E. dumosa*.

(2) Industrial oils, in which the main constituent is phellandrene, a valuable solvent. The chief species producing industrial oils are *E. phellandra*, *E. dives* type, *E. radiata* type, and *E. radiata* var. 'A.'

(3) Perfumery oils consisting largely of such aromatics as citrol, citronellal and geranyl acetate. The most important perfumery oils are produced by *E. citriodora*, *E. macarthuri*, *E. phlebophylla*, and *E. staigeriana*.

Investigations have shown that in some cases oils of quite different chemical composition are produced by botanically identical trees. In the case of *E. dives* four physiological forms have been established, and a similar occurrence has been observed in *E. radiata* and *E. australiana*.

Information is given on the distillation and marketing of the oils, and particulars of individual species are supplied under such headings as:—vernacular name of the plant; occurrence; yield of oil; cultivation; annual production; quality; colour; odour; use; constants (according to Penfold); and constituents.

A few general features of the chemistry of *Eucalyptus* oils are discussed in the last article, and the question of adulteration and methods of determining the cineol content are given attention. In conclusion, the uses of the various types of *Eucalyptus* oils are listed under appropriate headings.

34.26 : 12.26–8 (82). PONCE, L. P. **Essential oil of leaves of *Eucalyptus globulus* from groves in La Plata.** *Rev. Fac. Cienc. quim. La Plata* 16, 1941 (117–29). Chem. Abstr. 36 (5955). P.R.

Fresh leaves from mature trees yielded about 3 per cent. of essential oil which did not differ materially from that produced in other countries.

34.26 : 12.26–8. SCHLOTTERER, R. D. **Oil of Sandalwood, comments on the new monograph.** *Nat. Formulary Bull.* No. 9, 1941 (287–8). Biol. Abstr. 17 (2888).

The new monograph receives general approval except as regards the newly introduced standard of not less than 2 per cent. of esters calculated as santalyl acetate; it is generally considered that the oil distilled from the wood of *Santalum album* in India runs higher in santalyl esters than does oil distilled from the same wood in the United States. The 2-per-cent. standard, however, has been retained in N.F.VII.

34.26 (47.2–6). BÖHME, R. W. **Rubber from plants in the northern latitudes.** *Umschau* 45, 1941 (321–3). [G.] Chem. Abstr. 36 (6369). P.R.

A review of plants grown for rubber, primarily in the U.S.S.R. Data on planted areas and on yields are given.

34.26 (54). DENT, T. V. **Possible war-time sources of vegetable rubber in India.** *Indian For. Leafl.* (*Silviculture*) No. 22, 1942. pp. 16. [Forest Research Institute, Dehra Dun.]

The problem of developing war-time supplies of vegetable rubber in India is considered with reference to:—(*a*) emergency new plantations of rubber-yielding plants; (*b*) increasing the crops from existing rubber plantations; (*c*) exploitation of wild rubber-yielding plants. It is concluded that:—(*a*) there are no known plants that are capable of giving an appreciable yield of rubber in less than four years cultivation under Indian conditions, although Para (*Hevea brasiliensis*) or Ceara (*Manihot glaziovii*) rubber might give a worthwhile return in about four years; (*b*) intensive methods of management on existing rubber plantations in South India should give better results than could be expected from wild rubber-yielding plants; (*c*) wild *Ficus elastica* may be able to yield several hundred tons of raw rubber annually, and there are a number of wild Indian plants that may be capable of yielding emergency supplies of rubber and should be investigated at once; however, in order to develop any new source of vegetable rubber it will be necessary to guarantee satisfactory prices in advance.

34.26 (54.87). **Increasing the crops from Ceylon rubber estates.** *Rubber Research Scheme* (*Ceylon*) *Advisory Circular* No. 16, 1942. pp. 5. [Research Laboratories, Dartonfield, Agalawatta.] H.S.B.

34.26 (68). **The history of rubber production in South Africa.** *S. Afr. Min. Engng. J.* 53, 1942 (317, 319, 321, 323). L.S.

34.26 (72 : 728 : 8) : 97.1. POLHAMUS, L. G. **Rubber production as good land use in tropical America.** *Proc. eighth Amer. sci. Congr. 1940*, 5, 1942 (179–88). [U.S.D.A. Bureau of Plant Industry.] A.P.B.

34.26 (94). RICHARDSON, A. E. V. **The utilization of rubber-bearing plants.** *Aust. J. Sci.* 5, 1942 (11–5). Chem. Abstr. 37 (1057). P.R.

The possible production of rubber in Australia from *Hevea brasiliensis*, *Taraxacum koksaghyz*, *Parthenium argentatum*, *Cryptostegia grandiflora* and *Asclepias* sp. is discussed.

34.26 : 01.6. PADDICK, M. E. **Rubber producing plants. (Other than Guayule and rubber trees.) A list of references useful to investigators.** *Bull. Colo. St. Coll. Libr.* No. 12, 1942 (1–9). [Colorado Agricultural Exp. Sta.] Biol. Abstr. 17 (2746).

34.26 : 12.26–8. NAYLOR, E. E. **Rubber from a hardy tree.** *J. N.Y. bot. Gdn.* 44, 1943 (11–3).

The ornamental rubber-bearing tree, *Eucommia ulmoides*, has been little exploited so far because its rubber yield of about 3 per cent. of the dry bark weight and just over 2 per cent. of the dry leaf weight is considered too insignificant to justify commercial extraction. The elastic constituent exists in a solid condition in thin-walled cells which originate from parenchyma of the vascular tissue. Any tapping process is therefore impossible, and extractions must be made from ground portions by means of chemical reagents. Despite the small percentage of rubber contained in the leaf the annual leaf crop may possibly prove an economic source of supply. The quality of the rubber is said to be excellent. *Eucommia ulmoides* may readily be

grown from seed, and can also be propagated by means of cuttings and even by layering.

34.26 : 12.26–8. REGEL, C. v. ***Evonymus verrucosa* Scop., a rubber plant.** *Umschau* 45, 1941 (251–2). [G.] Chem. Abstr. 36 (6369). P.R.

This plant was investigated in the U.S.S.R. as a source of rubber. Its root bark yield is 25, the middle of the root 16, and the stalks up to 4 per cent. of rubber. The woody parts contain none. The rubber content varies with the season and the age of the plant. Plants growing in deciduous forests yield more than plants growing in the open field.

34.26 : 12.26–8. KARLING, J. S. **The response of *Achras zapota* in latex yield to wounding by the ibidem method of tapping.** *Bull. Torrey bot. Cl.* 69, 1942 (553–60). [Columbia University, New York.] O.B.D.

The results obtained from tapping experiments on *Achras zapota* in British Honduras show that this species cannot be tapped profitably by the ibidem method. To secure maximum yield per tapping the successive incisions in the cortex must be spaced 14 to 16 in. apart.

34.26 : 12.26–8. **Dye from Sassafras.** *Sci. News Letter* 42 (18), 1942 (279). U.S.D.A. Bibliog. (Plant Science) 1 (D–154).

A simple and economic process discovered by Dr. A. S. Shead of the University of Oklahoma whereby colouring matter (tan, brown and grey) may be obtained from the root bark of Sassafras.

34.26 : 12.26–8. TRESSLER, C. J., and ZIMMERMAN, W. I. **Three years' operation of an experimental sugar bush.** *Bull. N.Y. agric. Exp. Sta.* No. 699, 1942. pp. 24.

Includes data on lead contamination of Maple syrup with recommendations for its prevention or reduction.

34.27. Seeds. Fruits. Leaf Fodder. Fibres and Flosses

34.27 : 12.25. LITTLE, E. L. **Managing woodlands for piñon nuts.** *Chron. bot.* 6, 1941 (348–9). [S.W. Forest and Range Exp. Sta., Tucson, Arizona.] O.B.D.

Research is to be carried out by the United States Forest Service on the management of southwestern woodlands for piñon nuts, the edible, wingless seeds of *Pinus edulis*. At present the gathering of wild nuts provides employment each autumn for several thousands of pickers. The crops are, however, irregular and infrequent, and trees do not bear well until about 75 years old. The research project aims at finding the best methods of management for sustained yield of nuts and other forest products. A map of areas producing commercial piñon nut crops has been prepared for pickers and dealers, and improved methods of silviculture and harvesting are being investigated.

34.27 : 12.26–8 : 12.11.11. GHOSE, T. P., and KRISHNA, S. **Tamarind seed. A valuable source of commercial pectin.** *Indian For. Leafl.* (*Chemistry*) No. 23, 1942. pp. 7.

Tamarind (*Tamarindus indica*) seeds, which are at present a waste product of the Tamarind trade in India, consist of 55 per cent. of kernels and 45 per cent. of testa. The kernels have been found to contain 58·5 per cent. pectins. Methods of isolation and purification of the pectin are described and its possible commercial uses indicated.

34.27 : 12.26–8 : 33.0 : 21 : 23.26. MOHAN, N. P. **The Mesquite.** *Punjab For. Rec.* (*Silva Publ.*) 1 (9), 1940. pp. 11 + plates.

The Mesquite is indigenous to tropical and subtropical North and South America. It can thrive in areas where the rainfall is scanty and the climate semi-arid, and has been successfully introduced into India, into Australia, on the Karroo in South Africa and into areas of extremely low rainfall in Anglo-Egyptian Sudan. The two principal species of Mesquite are *Prosopis glandulosa* Terr. which is deciduous, and *P. juliflora* D.C., an evergreen or semi-evergreen species of which there are several American forms and an Australian form differing slightly in manner of growth and in leaf pattern.

The Mesquite is of considerable economic importance. It has proved invaluable in clothing dry, bare hillsides, e.g. in the Punjab, thus checking erosion. In Sind it has been particularly useful as a sand-binder. Natural reproduction of the tree over the Miani plain arising through goats eating the pods and thus distributing the seeds, has helped to form an effective screen against further inroads of drifting sand. The pods are sweet and succulent, of high nutritive value and useful as fodder for cattle and horses. The leaves, too, will be browsed when forage is otherwise scarce. The timber is hard and durable and of great value for fence posts. As the growth of the tree is rapid there is a good yield of fuel wood from which charcoal can be made. Other products are a black dye from the pods, used in the preparation of ink, honey from the flower spikes and a gum almost identical with gum arabic.

The paper includes an account of the silvicultural characteristics of *P. glandulosa* and the various forms of *P. juliflora*. It is recommended that particular attention be paid to the collection and storage of pods and to their protection against weevil attack. Direct sowings are not advised on account of slow germination. Suitable nursery methods for raising the species are entire planting, stump planting and pot planting. These are described in detail. After the planting out of the young trees, artificial watering in summer in very dry localities and protection against browsing is advisable for the first year or two. The worst enemies of the Mesquite when young are frost and white ants.

34.27 (54.5) : 12.26–8 : 23.2 : 23.23.15 : 33.0. READ, W. S. **A case for more fodder-bearing trees.** Govt. Cattle Farm, Hissar, Punjab. [1941?] pp. 7.

The semi-arid regions of the world, which are the natural environment of famous breeds of cattle, usually have indigenous to them varieties of drought-resistant trees and shrubs, often with edible leaves and pods. Such species can usually thrive on a much smaller annual rainfall than is required to produce surface grazing on the same area, and they are of great value for feeding livestock when drought has destroyed the grazing. Very little has been done to increase their numbers in India where there is unlimited scope for development.

The two main reasons for the failure of fodder trees to spread over the areas to which they are indigenous are:—(*a*) the entire absence of any organized effort (in the arid and semi-arid tracts at least) to inculcate in the peasant a love of trees, and to inspire him to develop them; (*b*) the habit of these particular varieties of trees is generally not satisfactory for self-propagation.

The Khikar (*Acacia arabica*) is the chief fodder tree

of the arid parts of North-West India. The wood, which is hard and strong and used in village carpentry, is also good for fuel and charcoal. The bark is used for tanning. The leaves and pods are eaten by all classes of livestock, and, as the tree grows to a considerable height, it is safe when mature from overgrazing. For propagation the seed is softened by being fed in the pods to sheep and goats and collected with the droppings, or by being soaked for several days in liquid manure. The prepared seeds should be sown after a shower of rain in borrow pits, along bunds, or in any suitable place where moisture accumulates. The seedlings should be protected with thorn from browsing.

The Mesquite (*Prosopis glandulosa*) gives two crops of edible pods annually. It has a root system which prevents erosion by binding the soil, and it also gives good shade and acts as a windbreak. The seed can be prepared for sowing by the method described above.

Suitable places for growing both these trees are on grazing lands, on bunds, on the boundaries of fields, in the borrow pits of village roads, round wells, as groves round villages and in compounds.

The 'Spekboom' or Elephant's Food (*Portulacaria afra* Jacq.) of S. Africa which has masses of edible fleshy shoots and leaves and a deep rooting habit, is suggested as possible for introduction into India.

34.27 (54) : 12.26–8. GHOSE, T. P. **Indian Kapok.** *Indian For. Leafl.* (*Chemistry and Minor Forest Products*) No. 32, 1942. pp. 10. [Forest Research Institute, Dehra Dun.]

Detailed information is given on Indian kapok (floss of *Bombax malabaricum*) with respect to its properties, and to the adulteration, harvesting, cleaning and preparing for market, and output and trade of this product.

34.27 (7). WHITFORD, A. C. **Fibre plants of the North American aborigines.** *J. N.Y. bot. Gdn.* 44, 1943 (25–34).

The structural fibres of *Sabal palmetto* were used extensively for many types of product from ropes to blankets, not only by the southern Indians in whose territory the palm grew, but also by the Iroquois Indians of New York who imported the fibre. Bast fibres, perhaps most commonly obtained from *Tilia americana*, were used for a variety of products, from coarse rope to fine cloth. Other trees or shrubs known to have provided fibres for the eastern aborigines are *Ulmus americana*, *U. fulva*, *Salix nigra*, *Dirca palustris*, *Betula papyrifera*, *Juglans nigra*, and *Asimina triloba*. Materials made from the fibres of three species of Gymnosperms have been found. The most common of these was from the papery bast of the Red Cedar. *Picea parryana* and *Larix laricina* are also known to have been used for their bast fibres.

34.27 (72) : 12.26–8. HAGEN, V. W. VON. **Mexican paper-making plants.** *J. N.Y. bot. Gdn.* 44, 1943 (1–10).

From botanical evidence and from numerous suggestions made by Spanish chroniclers the writer has deduced that the species of *Ficus* used in ancient Mexican paper-making included *F. petiolaris*, *F. padifolia*, *F. cotinifolia* and *F. involuta*. The Aztec word for paper (amatl) occurs in one form or another in the local names of all these trees. With the exception of Bull's-horn Acacia (*Acacia cornigera*), the main species used at present by the inhabitants of an isolated Aztec village in Chicontepec, Vera Cruz, also belong to the Fig or Mulberry family, Moraceae. The most important are *Ficus padifolia*, *F. involuta* and *Urera baccifera*. The Otomi Indians make use of *F. padifolia*, *F. goldmanii*, *Urera baccifera*, and *Morus* spp.

34.6. *Utilization of Logging and Milling Waste*

34.6 : 07.7. **Sawdust furnace.** *Wood* 8, 1943 (84).

A note on the Dolem furnace recently placed on the market by Leman's Timber Ltd., of Ealing. The furnace is claimed to deal efficiently with 3–4 tons of sawdust per day.

34.6 : 33.02. GRONDAL, B. L. **Logging waste and its potential value in pulp manufacture.** *Repr.* from *Pacif. Pulp Pap. Ind.* Feb., 1942. pp. [4]. [University of Washington.]

A study was made of the unutilized slash left after logging operations in western Washington with the purpose of eventually finding a means for salvaging this timber. In the present paper, figures are given to show the amount of pulpwood left on the areas examined. It is pointed out that there is no market for this material at the present time as the pulp mills are supplied with lumber logs, but that conditions are changing rapidly and with the expansion of the lumber market this pulpwood will become important to pulp manufacturers. However, there is considerable waste material present and the useful pulpwood will have to be segregated in the field before transportation to the mill if utilization is to be economical.

34.6 : 33.02 : 32.25.4–5 : 32.9. STENSTROM, D. G. **Pulpwood operations in British Columbia.** *Pulp Paper Mag. Can.* 44, 1943 (270–3). [Powell River Company, Ltd.]

A brief report is given on the equipment, method of operation, labour requirements and equipment operating costs for a portable pulpwood mill proposed for use in converting logging waste into material suitable for pulping. The equipment would be transported to the logging site on a 60-ft. donkey sled. Transportation of the wood to the pulp mill by water is also discussed. Cordwood operations on the West Coast are handicapped by the fact that most loggers are machine operators and do not favour the hand work that is required in cutting and handling cordwood.

34.6 : 33.06. **Waste wood as fuel on L.M.S. Railway.** *Engineering* 155, 1943 (195). L.S.

Experiments have shown that a mixture of waste wood and coal will raise steam in a locomotive almost as quickly as coal alone. The London Midland and Scottish Railway has adopted this method as a standard practice. It is claimed that 2 cwt. of waste wood saves 1 cwt. of coal.

34.6 : 33.06. TOWER, G. E. **Production and transportation of fuel from sawmill refuse.** *Leafl. Ore. Sch. For.* No. 4, 1942. pp. 27.

Includes data on the costs of production and of lorry, rail, and barge transport, under Oregon conditions, of domestic or industrial fuel from sawmill refuse.

34.6 : 33.06 : 07.7. GUMZ, W. Staubbrenner für Sägespäne und andere aschenarme staubförmige Brennstoffe. [**Burner for firing sawdust and other pulverized fuels of low ash content.**] *Feuerungstechnik* 30, 1942 (164–5). [G.] P.O.

A brief illustrated description is given of the 'Tornado' burner developed by Ohlsson in Sweden for burning sawdust under boilers. Modifications required

for firing peat are discussed and operational data are given.

34.6 : 33.17 : 12.25 : 33.06. VOORHIES, C. **An inventory of sawmill waste in Oregon.** *Bull. Ore. Engng. Exp. Sta.* No. 17, 1942. pp. 49.

Data are given on the type and volume of sawmill waste at 11 Pine and 29 Douglas Fir mills in Oregon. At present only about 30 per cent. of the waste is recovered in the form of fuel or other by-products.

34.6 : 33.3. ARIES, R. S. **Chemical utilization of wood waste.** *Chem. Ind.* 51 (2), 1942 (190–7). *Abstr.* in *Bull. Inst. Paper Chem.* 13 (43–4). P.O.

After briefly discussing the economic factors involved in the chemical utilization of wood waste, such as contractual arrangements, cost of transportation to consuming centres, and quality and quantity of available material, the author reviews present developments under the following headings:—fuel, distillation, pulp and paper products, bark for paper specialities, tanning and dye extracts, hydrolysis of waste wood for sugar and alcohol, utilization of waste lignin, plastics from wood waste, lignin resins, fillers, wood flour, lignocellulose fillers, composition products, and motor fuel. Chemical utilization of wood constitutes less than 8 per cent. of the total wood used in the United States, and of this only a very small fraction can be classified as waste wood utilization. Tabulated data on available logging waste, amount of waste in wood manufacture, and drain on commercial forests in the U.S., and a map showing United States forest resources are included. Thirteen references are given.

34.6 : 33.32 : 33.39. **Report of the Waste Committee [1942].** *Pulp Paper Mag. Can.* 44 (2), 1943 (195–7). [Canadian Pulp and Paper Association.]

New developments and possibilities in the utilization of mill waste include (*a*) the use of waste sulphite liquor for the production of D-ribose, lignin resins and alcohol, and (*b*) the use of waste wood for the production of various chemicals, plastics, etc. The recovery for use of chipper sawdust and bull screen tailings is suggested. Possible uses for bark are for the production of felt, in the manufacture of cheap papers, and as a source of tanning extract. A list of references to the relevant literature published during the year is appended.

34.6 (485) : 33.32 : 33.17 : 33.39 : 33.37. Tillvaratagande och förädling av mendervärdigt virke samt avfalls- och biprodukter i skogsindustrien. [**Utilization and manufacture of timber of inferior quality and the waste- and by-products of the forest industries.**] Industriens Utredningsinstitut Norrlandsutredningen, Stockholm. 1942. pp. 328. [Sw.sw.] N.D.A.

Wood is one of the principal resources of Norrland and its efficient utilization is important for the economic well-being of the people. At present the annual cut of timber is about equal to the annual growth and any further development of the forest industries will be dependent on a more intensive utilization of the available raw materials.

The present investigations have been concerned with technical problems in the development of the forest industries, in particular with the possibilities of more complete utilization of the material available, including wood of inferior quality, and the more proficient conversion of the waste- and by-products of the forest industries, including the development of entirely new branches of manufacture.

In the publication under review, reports are presented on the various lines of investigation and discussion is concerned with analysing the present position and pointing out the current problems of research and the probable future lines of development. There are four main sections as follows:—I. Forest waste and its utilization; II. Industrial utilization of wood waste; III. Utilization of waste- and by-products of the pulp industry; IV. Appendixes. The first three sections each comprise a series of reports on individual aspects of the main subject.

I. *Forest waste and its utilization.*—Data for this section were obtained from field investigations carried out during the summer and autumn of 1941 in the Swedish Cellulose Company's forests in the Söderhamn, Härnösand, Umeå and Luleå districts. Three papers are included in this section:—

(1) Tillgång och beskaffenhet. [Supply and quality (of wood waste).] T. Streyffert. (pp. 15–31).

Calculations show that under specified conditions and with a reduction of the minimum dimensions for exploitable material, e.g. from 4 in. × 6 ft. to 2 in. × 6 ft., the increase in timber output that could be obtained for all the river areas in Norrland and the province of Kopparberg would amount to approximately 4·6 million cu. m., solid measure, per year. This additional material, which corresponds to about 25 per cent. of the annual output of timber for structural purposes in the same areas in the years immediately preceding 1940, would include 2·7 million cu. m. of Pine (for fuel) and 1·9 million cu. m. of Birch.

In these calculations account has been taken of the position of the waste with reference to water-ways, in accordance with the zoning method adopted in the last State forest census.

A considerable part of the Birch is found in the interior of Norrland, where the stands are to a great extent overmature and damaged by rot.

(2) Förutsättningar för insamling av avfallet och transport till förädlingsverk. [Pre-requisites for the collection of waste and its transport to the mill.] T. Streyffert. (pp. 31–46.)

Most of the waste material left from Pine operations is of small diameter. The cutting costs, reckoned per cu. m. of timber, rise very rapidly as the diameter of the material decreases, due particularly to the increase in time required for barking in relation to the volume of wood obtained. The efficient utilization of small-dimension material is essentially a problem of eliminating barking operations in the forest. As regards the water transport of unbarked waste timber, the risk of sinkage is very great. Expedients which may be resorted to include bundling the material for floating or transporting it by motor lorry.

(3) Stubbved; tillgång och brytningsmetoder. [Stump wood; supply and methods of extracting.] B. Ternstedt. (pp. 47–58.)

Stump wood can be considered worth extracting only if it fulfils certain specified conditions as regards place of growth, age, size and supply per hectare. The supply of stump wood worth exploiting in Norrland has been estimated (very approximately) to be at least 3 million cu. m., stacked. Stump-pulling has been found to be considerably cheaper by means of tractors than by the older methods.

II. *Industrial utilization of wood waste.*—The possibilities of utilizing wood waste in various chemical conversion processes are discussed, five separate reports being included in this section of the bulletin:—

(1) Sågverksindustriens vedavfallsfråga. [The wood-waste problem in the saw-milling industry.] A. Mörch. (pp. 61–70.)

On the average only 50–60 per cent. of the cubic contents of sound timber is recovered from saw-milling in the form of sawn products (planks, battens, boards). Tests have been made to determine the possibilities of utilizing the waste material from saw-mills (*a*) as a fuel (to produce the power required to operate the saw-mill), (*b*) in the production of so-called small timber, (*c*) in charcoal burning, (*d*) as raw material for the sulphate pulp industry. That part of the waste from saw-milling that can be used for pulp manufacture is in such demand that it is competing with the main product as a raw material.

Present transport methods favour floating unbarked logs to the sawmill where barking is part of the conversion process. The bark is used to some extent for burning.

(2) Användningen av rötskadad ved i celluosaindustrien. [The use of rot-damaged wood in the pulp industry.] D. Johansson. (pp. 71–80.)

The use of rot-damaged wood reduces the quality of sulphate pulp. Wood containing loose rot caused, for example, by dry rot is largely dissolved in sulphate cooking but an uncooked fibrous substance is left, which in itself possesses little strength and which pollutes the pulp and impairs its colour. Where the loose rot is caused by corrosion rot (for example, root-, stem- or top-rot) it gives a relatively high percentage (by weight) of pulp, which is, however, darker and decidedly weaker than normal sulphate pulp. Generally, it can be stated that loose rot in different forms should not be included with sulphate wood. However, incipient rot, which is not extensive nor badly discoloured, will not seriously impair the properties of the sulphate pulp.

For sulphite pulp it is important to use material which is completely free from rot. If it is necessary to use rot-damaged wood in a sulphite factory, this must be cooked separately: the price obtained for such a product is relatively low.

(3) Björkved som råmaterial för cellulosatillverkning. [Birch wood as a raw material for pulp manufacture.] D. Johansson. (pp. 81–101.)

In Norrland Birch forms 13 per cent. of the total cubic volume and is therefore a raw material of the greatest importance.

Despite the fact that the length of Birch fibre is only about half that of Fir fibre, a pulp is obtained from Birch, either by sulphite or sulphate cooking, which yields a paper of relatively high strength qualities. The greatest value of Birch is, however, in the production of artificial-silk and similar pulps where length of fibre is of no consequence.

Water transport of Birch logs from the forest to the factory presents difficulties owing to the high percentage lost by sinkage. Experiments in Finland have shown, however, that if trees are felled and left to dry for a few weeks, with their foliage intact, then floating can safely be undertaken.

(4) Utnyttjande av skogs- och vedavfall genom försockring. [Utilization of wood waste by means of saccharification.] E. Hägglund. (pp. 102–107.)

Saccharification with strong sulphuric acid, with strong hydrochloric acid and with strong mineral acids is discussed, and also the production of dilute sugar solutions by means of saccharification with dilute mineral acids at a high temperature under pressure.

In these processes, the requirements as to quality of the wood raw material are very low, and mixtures of different kinds of wood can be used. The saccharification processes are thus particularly suitable for utilization of forest- and wood-waste of varying quality. In all cases wood residue is obtained as a by-product. Possibilities for its chemical utilization should be considered.

(5) Utnyttjande av skogs- och vedavfall genom kolning samt framställning av flytande och gasformiga bränslen. [Utilization of wood waste by carbonization, including the production of liquid and gaseous fuel.] H. Bergström. (pp. 108–119.)

Among the different uses for wood waste, the manufacture of charcoal occupies an important position. The most abundant supply of raw material for this purpose in the form of different kinds of forest waste is found in Upper Norrland. Many of the kilns at present in use are unsatisfactory; the yields of tar and oils obtained could be considerably increased if relatively simple alterations were made to them.

The production of producer gas, liquid fuel, solvents, etc. is dealt with.

For the prosecution of more effective technical research on charcoal burning and related problems, there is required above all, a larger number of qualified research workers, additional laboratory accommodation, better apparatus and more adequate economic resources.

III. *Utilization of waste- and by-products of the pulp industry.*—The following are the titles of the papers included in this section:—

(1) Sulfitlutens bestandsdelar. [Constituents of sulphite lye.] S. Ulfsparre. (pp. 123–9.)

(2) Utnyttjande av sulfitlutens lininbeståndsdelar. [Utilization of lignin constituents of sulphite lye.] G. Carlson. (pp. 130–8.)

(3) Framställning av sulfitsprit med särskild hänsyn till möjligheterna att öka spritutbytet. [Production of sulphite spirit with special reference to the possibilities of increasing the yield.] S. Ulfsparre. (pp. 139–59.)

(4) Översikt av olika anvandningsmojligheter för alkohol i organisk-kemisk industri. [Conspectus of the possibilities of using alcohol in industrial organic chemistry.] B. Groth. (pp. 161–7.)

(5) Odling av foderjäst på sulfitlut och sulfitslemp. [Cultivation of fodder yeast in sulphite lye and sulphite mucilage.] S. Ulfsparre. (pp. 168–73.)

(6) Sulfitlutens utnyttjande som bränsle. [Utilization of sulphite lye as fuel]. S. Ulfsparre. (pp. 174–87).

(7) Utvinning av kerniska produkter ur savartlut. [Extraction of chemical products from black lye.] D. Johannson. (pp. 188–202.)

(8) Svartlutens utnyttjande som bränsle. [Utilization of black lye as fuel.] E. Venemark. (pp. 203–10).

(9) Utvinning och förädling av terpentin, metanol och flytande harts. [Extraction and refining of turpentine, methyl alcohol and liquid resin.] I. Göthner. (pp. 211–19.)

(10) De oorganiska biprodukterna i cellulosaindustrien (mesa, kisaska). [The inorganic by-products of the pulp industry.] I. Klinga. (pp. 220–4.)
(11) Cellulosans användning för kemiska ändamål. [The use of cellulose for chemical purposes.] E. Hägglund. (pp. 227–32.)
(12) Ligninforskningen. [Lignin research.] H. Erdtman. (pp. 233–9.)
(13) Jäsningstekniska spörsmål i samband med träförädlingsindustrien (förutom framställning av alkohol och foderjäst). [Questions regarding fermentation technique in connexion with the timber industry (in addition to the production of alcohol and fodder yeast).] H. Lundin and L. Enebo. (pp. 240–66.)
(14) Växtförädling av skogsträd. [Forest tree breeding.] N. Sylvén. (pp. 267–78.) [Cf. *For. Abstr.* 5 (15).]

IV. Appendixes to the section on 'Forest waste and its utilization' are as follows:—

A. The quantity of wood waste each year when timber for structural purposes is scaled to 4-in., 3-in., 2½-in., and 2-in. minimum diameter.
B. Memorandum on calculating the quantity of potential waste that can be utilized by reducing the minimum size of timber to be scaled. E. Hagberg. (pp. 309–15.)
C. Results of an investigation of the relations of cutting costs with a reduction in minimum top diameter (i.b.) of pulpwood. C. G. Sundberg. (pp. 316–24.)
D. Memorandum regarding the possibilities of floating material of small dimensions in Dalälven and Ljusman. M. Nordguist. (pp. 325–7.)
E. Normal prices for motor-lorry transport of pulpwood and timber logs. (p. 328.)

38. FOREST CONSTRUCTIONAL WORKS. ENGINEERING

38.2. Boughton, R. V. **A timber transportable hut.** *Wood* 8, 1943 (78–80).

Notes on prefabricated huts manufactured in Britain by the Best-Burkle Products, Ltd.

38.2. Harvey, H. **World's largest hangar built of wood.** *Sth. Lumberm.* 166 (2088), 1943 (38, 40).

The use of steel-ring timber-connectors has made possible the construction of a wooden hangar having an unobstructed floor area 237 ft. wide and 1,000 ft. long and with the timber arches rising 153 ft. from the floor.

38.2. Limaye, V. D. **Wood disc dowel joints in timber framed structures.** *Indian For. Leafl.* (*Utilization*) No. 31, 1942. pp. 6 + plates. [Timber Testing Section, Forest Research Institute, Dehra Dun.]

The wood disc dowel joint has been developed in order to increase the efficiency of Indian timbers for constructional purposes. The disc dowel is a circular hardwood disc in the shape of a double conical frustum, which is fitted, half in each member of the joint, into pre-bored holes, and bolted to keep the members from spreading. Such a joint requires little steel, is simple to make, is efficient, and effects a considerable reduction in the cost of timber structures. [Cf. *For. Abstr.* 4 (244).]

38.2 : 12.25. **Douglas Fir use book: structural data and design tables.** West Coast Lumbermen's Association, Seattle. (5th ed.) [1942]. pp. 209.

38.2 : 12.25. **Working strengths of nails, spikes, drift bolts and wood screws in west coast woods.** *Douglas Fir Use Book Supplement* No. 2, 1940. pp. 7. West Coast Lumbermens' Association, Seattle.

38.2 : 12.25. **Strength of lag screws in Douglas Fir with tables of safe loads.** *Douglas Fir Use Book Supplement* No. 3, 1941. pp. 11. West Coast Lumbermen's Association, Seattle.

38.2. **Designing truss joints with timber connectors.** West Coast Lumbermen's Association, Seattle. [1942]. pp. 7.

38.3 : 31.27. Johnson, C. **Wheel load distribution for shear in timber bridge stringers.** *Wood Pres. News* 21, 1943 (6–10, 12). [North Dakota State Highway Department.] P.R.

Formulas are developed for determining the fraction of wheel load to use in calculating shear in stringers for timber bridges.

38.5. Harvey, H. **Wood tanks conserve essential war materials: water-storage and sewage-treatment tanks employ engineered timber construction.** *Timber of Canada* 3 (7), 1943 (66, 80).

An experimental wood tank of new design, having a capacity of 200,000 gal., has recently been constructed in Tacoma, Washington. It can be used for water, oil or sewage. Advantages of the tank are low cost of materials, simplicity of construction, and suitability for large storage capacity. It uses about one-third of the steel and one-half of the lumber required in the standard vertical-stave, steel-band type. A second tank of 500,000-gal. capacity is under construction and tanks of capacities up to 2,000,000 gal. are proposed.

4. FOREST INJURIES AND PROTECTION

42. INJURIES FROM INORGANIC AGENCIES, EXCLUDING FIRE

42.2. *Temperature Influences*

42.21 : 12.25. Balfour, F. R. S. **Low temperatures in January 1941 in S.E. Scotland and their effect on shrubs and trees.** *J. R. hort. Soc.* 66, 1941 (230–6). E.M.B.

Among the conifers that were injured or killed by low temperatures at Dawyck, where the lowest temperature recorded was 2° below zero, were *Araucaria imbricata*, *Abies delavayi*, *Athrotaxis cupressoides*, *A. laxifolia*, *Cedrus brevifolia*, *C. deodara*, *Juniperus recurva*, *Libocedrus chilensis*, *Picea likiangensis*, *P. morinoides*, *P. morrisonicola*, *Sequoia sempervirens*, and *Taxodium distichum*.

42.5. *Chemical Influences*

42.51 : 33.36.1. Ekstrand, H. Förgiftning av växter genom ett fluorhaltigt träimpregneringsmedel. [**Toxicity to plants of a fluorine-containing wood preservative.**] *Medd. Växtskyddsanst., Stockh.* No. 36, 1941. pp. 32. [Sw.g.] R.A.M. 22 (119).

From the experience and investigations reported in this paper it is apparent the fluralsil or other fluorine-containing antiseptics are unsuitable for use in disinfecting woodwork in greenhouses and on benches.

43. FOREST FIRES

43.0. *Predisposing Factors and Causes*

43.01 : 11.16.2. BUMSTEAD, A. P. **Sunspots and lightning fires.** *J. For.* 41, 1943 (69–70).

Results from a preliminary study indicate that while some relationship may exist between sunspots and lightning fires over a large area, little use can be made of this relationship in predicting the occurrence of lightning fires in a specific, limited area.

43.1. *Protective Measures*

43.1 : 94.3 (79.5 : 79.7). MATTHEWS, D. N., and MORRIS, W. G. **Adequate forest fire control based on a study of the Clackamas-Marion patrol unit in Oregon.** Pacific Northwest Forest and Range Exp. Sta., Portland, Oregon. 1942. pp. 77.

Analysis and discussion of fire occurrence and the control measures taken on private lands that have received fairly intensive protection for many years, with recommendations for attaining higher efficiency. Special stress is laid on the need for intensified protection under war-time conditions.

43.12 : 07.7. EUBANKS, W. B. **A supplement to the fire finder.** *J. For.* 41, 1943 (70–1).

A series of profiles of the topography radiating from a lookout tower has been found effective as an aid for the quick and accurate location of fires. The method of making and using a set of profiles is described.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

44.2. *Parasitic Higher Plants*

44.2 : 12.25 : 12.26–8. POMERLEAU, R. **Le gui de l'epinette noire dans le Quebec. [The Black Spruce mistletoe in Quebec.]** *Nat. canad.* 69 (1), 1941 (11–31 + plates). [F.] Biol. Abstr. 17 (6609).

Distribution, development, fertilization and effect on hosts of the small mistletoe, *Arceuthobium pusillum*, a parasite of *Picea*, *Larix* and *Pinus*.

44.3. *Fungi*

44.3 : 07.7. TEHON, L. R. **Diseases of trees. Flours and casein improve spray action.** *Amer. Nurseryman* 77 (2), 1943 (26–7).

Experiments by Dr. A. A. Nikitin and Dr. E. G. Anderson, Copperhill, Tennessee, on the effect of supplementary materials added to sprays as spreaders or stickers showed that the addition of protein-containing supplements resulted in (1) an increase in the amount of copper deposited on the sprayed surface, (2) greater resistance of the spray residue to the action of rain and weather, (3) increased solubility of the copper contained in the residue, and (4) greater retention of soluble copper on the sprayed surface. The effectiveness of the spray appeared to increase with the amount of protein contained in the supplementary material. Soybean flour, with a protein content of about 53 per cent., was the most successful of the materials tested.

44.3 : 12.25 : 12.11.12. YORK, H. H. **Detecting pathological regions and nonconducting tissues in living Pine trees by means of dyes.** *Abstr. in Phytopathology* 33, 1943 (20). [American Phytopathological Society, 34th annual meeting.]

It was observed that when White, Red and Scotch Pine trees were cut off near ground level and stood in aqueous solutions of dyes for 36 to 72 hours, certain dyes penetrated the living wood up to the tips of the needles. Regions in the stem which the dyes failed to penetrate were found to be infected with fungi or bacteria.

44.3 (79.4) : 23.27. MILLER, P. A. **Disease problems of ornamental trees in southern California.** *Arborist's News* 7 (11), 1942 (81–4). U.S.D.A. Bibliog. (Plant Science) 1 (D–173).

44.3 (43.1–5) : 12.25 : 12.26–8 : 12.21. ZILLIG, H. Beiträge zur Adventivflora des Moselgebietes. **[Contributions to the exotic flora of the Moselle region.]** *Angew. Bot.* 24, 1942 (352–93). [G.] R.A.M. 22 (53).

White Pine (*Pinus strobus*) stands in this region that are attacked by *Cronartium ribicola* have little chance of survival, and in future the species will be perpetuated only in small plantings in *Ribes*-free districts. *Ceratostomella ulmi* has been present on Elms in the vicinity of the Rhine and on the heights above Coblenz since about 1928, *Ulmus montana* and its hybrids being chiefly affected, though *U. campestris* is also liable to virulent infection. Direct control measures are impracticable and the removal of diseased trees is essential.

44.3 : 12.26–8 : 22.22. ROTH, E. R., and HEPTING, G. H. **Origin and development of Oak stump sprouts as affecting their likelihood to decay.** *J. For.* 41, 1943 (27–36). [Bureau of Plant Industry, U.S.D.A.]

White Oak (*Quercus alba*) stumps up to about 16 in. in diameter or 100 years old sprouted prolifically, and those above these limits sprouted very little. Black and Scarlet Oak (*Q. velutina* and *Q. coccinea*) stumps sprouted well up to about 22 in. in diameter or 150 years old, and very little above these limits. The following factors had little material effect upon the amount of sprouting:—stump height, season of cutting, presence of butt rot when cut, and the occurrence of fire immediately after logging. Sprouts of lowest origin on the parent stump are least likely to develop butt rot from the stump. Sprouts of satisfactory low origin followed cutting very low stumps and also occurred after burning following clear-cutting. Although sprouts of high origin were in the minority, they very definitely tended to become the dominant sprouts within a clump when 12-in.-high stumps were left and the area not burned over. Measures to be taken early in the life of a sprout Oak stand, to insure the successful development of sprouts of low origin and therefore low decay hazard, are suggested.

44.3 : 22.22 : 12.26–8 : 24.31 : 12.21. ROTH, E. R., and HEPTING, G. H. **Wounds and decay caused by removing large companion sprouts of Oaks.** *J. For.* 41, 1943 (190–5). [Bureau of Plant Industry, U.S.D.A.]

The cutting of Oak companion sprouts larger than about 3 in. in diameter at the base exposes the remaining stem to decay. The aims of the work described in this report are the determination of the amount of decay that develops following the different methods of companion-sprout elimination and the rates of healing of different types and sizes of wounds.

Companion sprouts of different sizes and with different types of crotches were removed by cutting flush with the remaining stem, cutting off at 3 ft. and by girdling. The smaller the wound the more rapidly it healed. Due to bark dieback and slow healing, wounds about 6 in. wide or wider did not heal back to

their original size until four years had elapsed. At the end of 5 years one-half of the girdled trees and 3-ft. stubs had died back to the crotch. The other half bore living sprouts.

44.3 : 12.25 : 12.21. La pourriture alvéolaire du bois des pins. Le polypore du pin. [**Alveolar decay of the wood of Pines. The Pine polypore.**] *Ann. Ec. nat. For.* 8 (1), 1941 (125–32). [F.] Biol. Abstr. 17 (7056).

An account is given of the characters and mode of development of, damage caused by, and means of combating *Xanthochrous pini* (= *Fomes pini*), the agent of aveolar decay in wood of *Pinus maritima*, *P. laricio* and *P. sylvestris*.

44.3 : 12.25. MILLER, J. K. ***Fomes annosus* and Red Cedar.** *J. For.* 41, 1943 (37–40).

Red Cedar (*Juniperus virginiana*) in the southeastern United States may be attacked by *Fomes annosus* which kills trees of all ages and causes a pocket rot of butt logs. This tree is particularly susceptible to attack by the fungus when overtopped by competing trees, but *F. annosus* will cause little damage if Cedars are grown on suitable sites and exposed to full sunlight; silvicultural practices that reduce or eliminate competition for light should greatly reduce losses from the disease.

44.3 (481) : 12.25 : 12.26–8 : 12.21. ROLL-HANSEN, F. Litt om rotkjuken. [**Notes on *Polyporus annosus***.] *Tidsskr. Skogbr.* 50 (7/8), 1942 (208–12). [Nor.] N.D.A.

Each year *Polyporus annosus* destroys Norway Spruce timber of considerable value. On areas where damage is worst the tree species should be changed from Spruce to Larch, Douglas Fir, Silver Fir or hardwoods, all of which have greater resistance to this fungus. Scots Pine is more susceptible to attack by this fungus on the west coast of Norway than in the east. F. F.

44.3 : 12.26–8 : 12.25 : 12.21. GROSJEAN, J. Het parasitaire Karakter van eenige Polyporaceeën. [**The parasitic character of certain Polyporaceae.**] Thesis, Univ. Amsterdam. 1942. pp. 96. [Du.] *Abstr.* in *Z. PflKrankh.* 52 (9/10), 1942 (464). R.A.M. 22 (117–8).

Field and laboratory experiments, on living trees and cut branches respectively, indicated that certain Polyporaceae commonly inhabiting old tree trunks act as true parasites, though their progress is very slow; infection occurs only when the oldest annual rings are inoculated, depending for its success, moreover, on the nature of the substratum, wood being superior to bread in the laboratory tests. An isolate of *Fomes igniarius* from *Amelanchier vulgaris* gave positive results on Oak, (*Quercus pedunculata*), Poplar (*Populus alba*), and Alder (*Alnus incana*) and an isolate of the same fungus from Birch (*Betula verrucosa*) gave positive results on Alder (*A. glutinosa*). A strain of *F. laricis* attacked Douglas Fir (*Pseudotsuga taxifolia*), and an isolate of *F. pomaceus* was pathogenic to Bird Cherry (*Prunus avium*).

44.3 : 12.25 : 12.21. FRACKER, S. B. **Blister rust control and grain-rust control in the west.** *Proc. 22nd-23rd annu. Conf. W. Plant Bd.* [1942] (40–3). [U.S. Bureau of Entomology and Plant Quarantine.]

Includes a brief account of the progress made in the eradication of *Ribes* for the control of White Pine blister rust in the western United States.

44.3 (71.3) : 12.25 : 12.21 : 91.8. DICKSON, J. R. **White Pine blister rust control in Ontario as post-war employment.** *For. Chron.* 19, 1943 (40–3). [Dominion Forest Service, Ottawa.]

The distribution of the White Pine blister rust in Ontario and conditions relating to its control, both natural and artificial, are discussed briefly, and suggestions are made for the preliminary work in connexion with a province-wide rust-control project, should that be undertaken.

44.3 : 12.25 : 12.21. RIKER, A. J., KOUBA, T. F., BRENER, W. H., and BYAM, L. **White Pine selections tested for resistance to blister rust.** *Abstr.* in *Phytopathology* 33, 1943 (11). [American Phytopathological Society, 34th annual meeting.]

Seedlings and veneer grafts from over 150 selected White Pines, which had shown no blister rust after 15 to 20 years' natural exposure to infected *Ribes*, were tested by both natural and artificial inoculation. Among the progeny from the first 63 selected trees, inoculated in September, 1941, about 5 per cent. of the grafts and, with certain selections, 100 per cent. of the seedlings showed infection by the autumn of 1942.

44.3 : 12.25 : 12.21 : 23.26. SLEETH, B. **Fusiform rust control in forest-tree nurseries.** *Phytopathology* 33, 1943 (33–44).

Measures tried out in a Brooklyn (Mississippi) nursery to control fusiform rust (*Cronartium fusiforme*) on Slash Pine included spraying, the establishment of an Oak-free zone 1,500 ft. wide, late sowing, and chemotherapy. All spray treatments (Bordeaux mixture (8–8–100), Copper Hydro, and dry lime-sulphur) gave some degree of control, Bordeaux mixture proving most successful. Copper Hydro (a commercial fungicide) was only slightly less effective, and dry lime-sulphur gave least control. The 1,500-foot-wide Oak-free zone failed to protect Slash Pine seedlings from infection. Extension of the zone in order to give more effective control would be an expensive and not too promising measure. Reduced rust infection was noticeable in late-sown seedlings. The application of para- or ortho-toluene-sulphonylamide to the surface of the soil about the time of peak sporidial production caused no reduction in the number of cankered seedlings. Loblolly and Longleaf Pine (especially the latter) showed more resistance to fusiform rust than did Slash Pine.

44.3 : 12.25 : 12.21. LOHMAN, M. L., CASH, E. K., and DAVIDSON, R. W. **An undescribed *Atropellis* on cankered *Pinus virginiana*.** *J. Wash. Acad. Sci.* 32, 1942 (296–8). [U.S.D.A. Bureau of Plant Industry.] L.S.

The fungus was found on cankered twigs and small branches and on the main seedling stem of *Pinus virginiana* Mill. in Virginia and North Carolina. Inoculations have not yet been carried out, but the fungus, in view of its constant association with cankers and discoloured wood, appears to be pathogenic. The new species is described in detail and the name *Atropellis apiculata*, sp. nov. is suggested.

44.3 (74 : 75) : 12.25 : 12.21. DILLER, J. D. **A canker of eastern Pines associated with *Atropellis tingens*.** *J. For.* 41, 1943 (41–52). [Bureau of Plant Industry, U.S.D.A.]

A twig- and branch-girdling canker caused by *Atropellis tingens* was widespread throughout the eastern United States in 1933 and 1934, occurring on most native eastern Pines and on several exotic Pine species. Slash Pine (*P. caribaea*) appeared to be the most

susceptible species. The canker caused flagging in the crowns of all size classes, though particularly in trees 15 to 30 ft. in height. The epidemic subsided without causing serious damage and no control measures are recommended.

44.3 : 12.25 : 12.21 : 23.26. RIKER, A. J., GRUENHAGEN, R. H., and ROTH, L. F. **Control of damping-off of nursery Pine seedlings.** *Abstr.* in *Phytopathology* 33, 1943 (11). [American Phytopathological Society, 34th annual meeting.]

Of 26 substances tested in three Wisconsin forest nurseries, both in the greenhouse and out-of-doors, for the control of damping-off among Red Pine seedlings, the best results were obtained by using a combination seed dust with mercuric phenyl cyanamide and cadmium oxide (used mainly against *Pythium*) plus a seed-level soil application of $\frac{3}{4}$ oz. calomel per 4 ft. × 12 ft. seedbed (used primarily against *Rhizoctonia*). Owing to the shortage of mercury, tetramethyl thiuramdisulphide was tested, and when about $\frac{3}{4}$ oz. per 4 ft. × 12 ft. seedbed was applied 3 days before seeding, it was comparable to the combination treatment with respect to ease of application, negligible injury to seedlings, high germination and commercial control. In addition it killed many weed seeds.

44.3 : 12.25 : 12.21 : 12.14.8. SELISKAR, C. E. **Decay in Douglas Fir cork and studies in the cultural identification of fungi causing decay in Western Hemlock and Douglas Fir.** *Univ. Wash. For. Cl. Quart.* 16 (1), 1942–43 (5–11 + plate).

Pure cultures of *Mortierella simplex*, *Dematium* sp., an unidentified Basidiomycete, and another fungus, probably a species of *Chalara*, were consistently isolated from decaying Douglas Fir bark. Inoculation tests, so far, indicate a particularly strong development of hyphae of the unidentified Basidiomycete, and it seems possible that it is associated with the production of decay. The article also contains notes on cultural identification studies of fungi that cause decay in the wood of Douglas Fir and Western Hemlock.

44.3 : 12.26–8 : 12.21 : 12.11.3. GRAVES, A. H. **Breeding for development of a timber type of disease-resistant Chestnut.** *Abstr.* in *Phytopathology* 33, 1943 (18). [American Phytopathological Society, 34th annual meeting.]

Crosses made in 1931 between the Japanese Chestnut (*Castanea crenata*), a blight-resistant species of fairly low stature, and the American Chestnut (*C. dentata*), a tall species which is susceptible to blight (caused by *Endothia parasitica*), show that the American species tends to be dominant as regards growth habit and incompletely dominant as regards blight susceptibility. Some of the F_2's so far obtained (now 5 years old) give evidence of the desired growth habit and disease resistance. See also *Amer. J. Bot.* 29, 1942 (622–6).

44.3 (73) : 12.26–8 : 12.21. **Dutch Elm disease quarantine. Revision of quarantine and regulations effective October 1, 1941.** Bureau of Entomology and Plant Quarantine, U.S. Department of Agriculture. 1942. pp. 4. R.A.M. 22 (112).

As from 1st October, 1941, the 'regulated areas' for the purpose of Dutch Elm disease (*Ceratostomella ulmi*) control are extended to include parts of nine counties of Pennsylvania and additional sections of Connecticut, New Jersey and New York in which the fungus has been located. The regulations prohibit inter-state movement from within the regulated areas to any outside area of all parts of Elms of all species, with the exception of Elm timber or products manufactured from or containing Elm wood, if entirely free from bark.

44.3 : 12.26–8 : 12.21. Memoria de los trabajos realizados por la Estación de Fitopatologia Agricola de la Coruña. Ano 1941. **[Report on the work performed at the Corunna Station of Agricultural Phytopathology during the year 1941.]** *Publ. Estac. Fitopat. agric. Coruña* No. 20, 1942. pp. 48 + figs. + dgm. + gphs. R.A.M. 22 (52).

An account is given of investigations carried out on seven strains of the Chestnut ink disease (*Phytophthora cambivora*). It is reported that copper oxychloride and copper carbonate treatments when applied to the roots of 2-year-old transplants again proved efficacious [cf. *For. Abstr.* 4 (249).] In the laboratory the lethal dose of the copper ion was found to be 1 in 100,000.

44.3 : 12.26–8 : 12.21. FREZZI, M. J. Muerte del tamarisco, ocasionada por '*Botryosphaeria tamaricis*', en Corrientes, Argentina. **[Tamarisk canker due to *B. tamaricis* in Corrientes, Argentina.]** *Rev. Argentine Agron.* 9 (2), 1942 (110–3). E.S.R. 88 (359–60).

A study of a canker of *Tamarix gallica* caused by a fungus provisionally identified as *B. tamaricis*. The fungus is described and an account is given of its behaviour in culture and on the host tree.

44.3 (77.3 : 77.5–7) : 12.26–8 : 12.21. HENRY, B. W., and MOSES, C. S. **An undescribed disease causing rapid dying of Oak trees.** *Abstr.* in *Phytopathology* 33, 1943 (18).

A fungus, tentatively placed in the genus *Chalara*, was isolated from the wood of 116 out of 122 infected trees of the Red Oak group in 1941 and 1942, but was not obtained from 56 trees showing no symptoms of the disease. A slight crinkling of the leaves was the first indication of infection. No infected trees of the Red Oak group have been known to recover. The presence of the disease in the southern half of Wisconsin and at a few places in Minnesota, Illinois and Iowa has been confirmed by cultural diagnosis.

44.3 (75.8 : 76.2) : 12.26–8 : 12.21. JENKINS, A. E. ***Sphaceloma* causing scab of *Magnolia grandiflora*.** *Abstr.* in *Phytopathology* 33, 1943 (6). [American Phytopathological Society, 34th annual meeting.]

Infection of the leaves of *Magnolia grandiflora* by a new, probably indigenous, species of *Sphaceloma* has been reported recently from Georgia and Mississippi. The organism produces circular or irregular, raised, grey spots, often not more than 1·5 mm. in diameter, on the upper surface of the leaves. When occurring in large numbers they cause areas of the leaf to appear discoloured. In cases of severe infection the leaf tissue may be killed.

44.3 (75.4) : 12.26–8 : 12.21. RUPERT, J. A., and LEACH, J. G. **Willow blight in West Virginia.** *Phytopathology* 32, 1942 (1095–6). [West Virginia University, Morgantown.]

A slight outbreak of Willow blight occurred in two adjacent counties of West Virginia in 1941–42. The native species were probably infected from planted stock. Of the two fungi commonly associated in the disease, *Physalospora miyabeana* Fuk. (probably the more virulent species) was the first to be observed on blighted twigs, but in May, 1942, *Fusicladium saliciperdum* Tub. was fruiting freely on infected petioles.

Cladosporium, a saprophytic species, appeared on diseased leaves soon after they began to die. A species of *Macrophoma* was occasionally found fruiting in old cankers and dead twigs, but was never isolated in the early stages of infection. [Cf. *For. Abstr.* 4 (191)].

44.3 (66.9) : 12.26–8. NIGERIA. **Annual report on forest administration for the year 1941.** Forest Department, Ibadan. [1942?] pp. 19.

Two diseases are reported from forest nurseries in Benin (Southern Nigeria). One causes multiple branching of the leading shoot of *Entandrophragma cylindricum*, and the second appears as acute chlorosis of *Sarcocephalus diderrichii* (p. 3).

44.3 : 12.26–8 : 12.21. ZENTMYER, G. A., and HORSFALL, J. C. **Internal therapy with organic chemicals in treatment of vascular diseases.** *Abstr.* in *Phytopathology* 33, 1943 (16–7). [American Phytopathological Society, 34th annual meeting.]

Dutch Elm disease was reduced in severity by injecting the infected Elms (6–10 ft. high) with quinone, pyrogallol, *p*-nitrophenol, 8-hydroxyquinoline sulphate, and hydroquinone. Results on 70 verticillium-infected Maples, 34 of which were injected with 8-hydroxyquinoline sulphate in 1941, showed that 56 per cent. of the treated trees and 28 per cent. of the checks had improved or shown no further decline in 1942.

44.3 : 12.29 : 12.21. **Preliminary report on the occurrence of higher fungi on Bamboos in and about Calcutta.** *Sci. & Cult.* 8, 1942 (194). L.S.

Thirty-one species of fungi have been collected in Calcutta and its suburbs from living and dead Bamboo. The species are named and their habitat noted.

44.4. *Virus Diseases*

44.4 : 12.26–8. T[EHON], L. R. **Mosaic, new virus of Elm.** *Amer. Nurseryman* 77 (4), 1943 (28–9).

Of 22 young American Elms on which patches of bark from diseased trees had been grafted in June, 1939, 19 trees showed symptoms of Elm mosaic by June, 1940. Grafts from the bark of these artificially infected Elms caused the disease to spread to new trees, but attempts to transmit infection by means of root grafts and sap transfers failed completely. The number of trees at present affected by Elm mosaic is not large, and no cases of death from this cause have been reported. The symptoms of the disease are described.

45. DAMAGE BY ANIMALS

45.1. *Mammals*

45.11 : 12.26–8 : 13.2 : 23.1. BALDWIN, P. H., and FAGERLUND, G. O. **The effect of cattle grazing on Koa reproduction in Hawaii National Park.** *Ecology* 24, 1943 (118–22). [Hawaii National Park, National Park Service, U.S. Department of the Interior.]

Acacia koa is particularly susceptible to damage by grazing cattle, and in many localities Koa forests have been almost completely destroyed. A comparison of Koa reproduction on sample plots representing three different intensities of grazing proved conclusively that the suppression by cattle of reproduction accounts for the failure of once-existent groves to perpetuate themselves over a large portion of the Hawaii National Park.

45.12 : 12.25 : 13.2. RECKNAGEL, A. B. **Susceptibility of Japanese Larch and Jack Pine to deer browsing.** *J. For.* 41, 1943 (216). [Cornell University.]

Japanese Larch planted in a forest near Ithaca, N.Y., within easy reach of deer, was found to be 100 per cent. immune from browsing. Jack Pine under similar conditions was severely damaged, though this species is possibly less susceptible to browsing than Red Pine.

45.3. *Insects*

45.3. MURPHY, D. F. (to Röhm & Haas Co.). **Insecticidal sprays for use on living plants, as in control of scale on trees.** *U.S. Patent* No. 2,294,238, Aug. 25, 1942. Chem. Abstr. 37 (1006–7). P.R.

About 0·01–0·25 per cent. of a thiocyano substituted ethyl ether, or thiocyano ethyl ester of a higher fatty acid, is used with water, an emulsifying agent, and about 2 per cent. of a spray oil.

45.3 (71.5): 13.2. BALCH, R. E., and HAWBOLDT, L. S. **Report on forest insects in New Brunswick, 1942.** *Rep. Dep. Lands & Mines New Brunswick 1942*, 1943 (116–8). [Dominion Entomological Laboratory, Fredericton, N.B.]

A further reduction in the numbers of the European Spruce sawfly (*Gilpinia hercyniae*) in New Brunswick is reported. The sawfly disease [cf. *For. Abstr.* 3 (82)] was the major control factor in 1942. Dieback in mature stands of Birch, resulting from attack by the bronze Birch borer (*Agrilus anxius*), is apparent thoughout most of the province and the affected area is extending into Quebec, Nova Scotia and Maine. Other insect species reported from New Brunswick include the Balsam woolly aphid (*Adelges piceae*), the Larch casebearer (*Coleophora laricella*), the Grey Birch leafminer (*Fenusa pumila*), the Birch leaf-mining sawfly (*Phyllotoma nemorata*), the Birch leaf skeletonizer (*Bucculatrix canadensisella*), the Beech scale (*Cryptococcus fagi*), and a gall aphid (*Pineus pinifoliae*) on White Pine.

45.3 (71.6) : 13.2. BALCH, R. E., and HAWBOLDT, L. S. **Report of forest insect conditions in Nova Scotia, in 1942.** *Rep. Dep. Lands For. Nova Scotia 1942*, 1943 (50–4 + plates). [Dominion Entomological Laboratory, Fredericton, N.B.]

The position in Nova Scotia during 1942 with regard to the more important forest insects is noted briefly. These include the European Spruce sawfly (*Gilpinia hercyniae*), the black-headed budworm (*Peronea variana*), the Balsam woolly aphid (*Adelges piceae*), the bronze Birch borer (*Agrilus anxius*), the Larch casebearer (*Coleophora laricella*), the White Pine weevil (*Pissodes strobi*), and a gall aphid (*Pineus pinifoliae*) on White Pine. [Cf. preceding abstract.]

45.3 (71.21) : 13.2. SASKATCHEWAN. **Annual report of the Department of Natural Resources of the Province of Saskatchewan for the fiscal year ended April 30, 1942.** King's Printer, Regina. 1943. pp. 127.

Forest insects that were reported to be causing damage during the season include the Jack Pine budworm, the Spruce gall aphid (*Adelges abietis*), the forest tent caterpillar (*Malacosoma disstria*) and the early Aspen leaf curler.

45.3 (74.6) : 13.2. FRIEND, R. B. **Connecticut State entomologist: forty-first report, 1941.** *Bull. Conn. agric. Exp. Sta.* No. 461, 1942 (463–548 + index).

Investigations on the biology of the pales weevil (*Hylobius pales* Herbst.) have shown that the adults are attracted to an area by the odour of freshly-cut Pine stumps, slash, logs and sawn lumber. They feed on the bark of young Pines or on the twigs and small

branches of older trees. White Pine is the favourite host plant, but other trees are often attacked. Young Pines near stumps are more likely to be killed than those further away. In order to avoid severe injury by this insect it is customary to delay planting White Pine on cut-over land until the third season after cutting. The practice has certain disadvantages, however, as a heavy cover of vegetation usually develops within this period. Tests to determine the mortality of trees planted in the second year after cutting indicate that a survival of 80 per cent. may be expected. Natural reproduction is probably more susceptible to injury than planted stock.

An extensive project of trapping Elm bark beetles was undertaken in Connecticut in 1941. *Hylurgopinus rufipes* was the most common Elm bark beetle in the town of Woodbury, where records were relatively complete. *Scolytus multistriatus* was also present in large numbers. Examination of breeding material in various parts of Connecticut revealed that *Scolytus sulcatus* Le C., although relatively much less common than *S. multistriatus*, is not so uncommon as was previously supposed. This species also is capable of transmitting Dutch Elm disease. Some parasites of Elm bark beetles are noted.

Studies on insects affecting coniferous plantations, particularly the Pine weevil (*Pissodes strobi*), the European Pine shoot moth (*Evetria buoliana*), and the Spruce gall aphid (*Adelges abietis*) are still continuing. Other forest and shade-tree pests examined during the year included *Scolytus* spp., *Symmerista albifrons* S. & A., *Malascosoma americana* F., *Galerucella luteola* Müll., *Chalepus dorsalis* Thunb., *Coleophora laricella* Hübn., *Gilpinia frutetorum* F. and *Ellopia athasaria*.

Tests with rabbit repellents were inconclusive, but so far, the three showing greatest promise were (1) Rezyl, asphalt emulsion, ethylene chloride, copper sulphate, copper carbonate, lime sulphur, (2) Rezyl, asphalt emulsion, ethylene chloride, copper carbonate, lime sulphur, and (3) asphalt emulsion, ethylene chloride, copper carbonate, lime sulphur, dicalite.

45.3 : 13.2 : 13.14–5. GÄBLER, H. Die kleine Fichtenblattwespe *Lygaeonematus pini* Retz. (*Nematus abietinus* Christ.), ihre Prognose und die Aussichten für ihre Bekämpfung. **[The small Spruce sawfly *Lygaeonematus pini* Retz. (*Nematus abietinus* Christ.), its prognosis and the prospects for its control.]** *Thar. forstl. Jb.* 91, 1940 (646–86). [G.] *Abstr.* in *Z. PflKrankh.* 52 (420). I.I.E.

Numerous observations on the phenology and biology of *Lygaeonematus pini* Retz. which is responsible for considerable damage in Spruce stands. Control of the pest is rendered difficult by the short period of larval development and the phenological overlapping of the different phases. The period for carrying out successful counter-measures is confined to a few days and is dependent on weather conditions. Dusting with a pyrethrum-derris powder or a dinitro-*o*-kresol preparation was not wholly successful, in spite of favourable laboratory results, owing to unsuitable weather (in particular, rain) during the period of the test. The use of aeroplanes in dusting operations is recommended.

45.3 (71.4) : 13.2. GOBEIL, A. R. **Forest entomology. Fourth annual report for the year ending March 31st, 1941.** Extract from the report of the Department of Lands and Forests of the Province of Quebec. *Contr. Dep. Lands For., Quebec* No. 14, 1942. pp. 16.

The activities of the Quebec Forest Service with respect to forest entomology are divided into six Sections as follows:—(*a*) forest insect survey, (*b*) permanent sample plots and inspections, (*c*) insect bionomics, (*d*) biological control, (*e*) silvicultural and natural control, and (*f*) publicity. The work of each of these sections is dealt with briefly in the present report.

The most frequent and most damaging insect observed during the season was the European Spruce sawfly (*Diprion polytomum*). *Pristiphora erichsonii* was found in all Larch stands; in one district it was almost completely destroyed by the parasite *Mesoleius tenthredinis* and elsewhere was attacked by a parasite known as *Bessa selecta*, which appeared to attack the European Spruce sawfly as well. Insects abundant locally included Leconte's sawfly (*Lophyrus lecontei*), the Pine spittle bug (*Aphrophora parallela*), the White Pine weevil (*Pissodes strobi*) and the Birch and Mountain Ash sawflies.

Of sixteen parasites liberated against the European Spruce sawfly, the cocoon parasite, *Microplectron fuscipennis*, was the most successful. Analysis of ecological factors in Spruce stands affecting the sawfly population showed that the humus layer, sunlight, the age of the stand, and the abundance of shrews and squirrels were among those of importance. The Section on insect bionomics completed a project to determine the effect of some factors on the breaking of the diapause in sawflies, and results of the study are recorded. Another study, on the development of the European Spruce sawfly as influenced by climatic factors, was begun in 1939 and is still in progress.

45.3 (43.9) : 13.2. GYÖRFI, J. Magyarországi szúfélék rovarellenségei. **[Insect enemies of Hungarian bark beetles.]** *Erdész. kiserl.* (*Sopron*) 43 (1/2), 1941 (32–65). [Hung.g.] Biol. Abstr. 17 (3225).

Predaceous and parasitic insects that attack bark beetles in various regions of Hungary were investigated in the field and in the laboratory. Numerous families of Coleoptera, Hymenoptera, Neuroptera, Diptera, and Rhyncota were represented. These are listed, with their host beetles, the trees upon which they were found, and the localities in which they were collected. Among the most important are species of Staphylinidae, Cleridae, Nitidulidae, Braconidae, Chalcididae, and Lonchaeidae. Bark beetles of conifers have more insect enemies than those of broadleaved species. The beneficial insects play an important rôle in keeping down the numbers of bark beetles, but their importance should not be overestimated.

45.3 : 13.2 : 13.15. HODSON, A. C. **An ecological study of the forest tent caterpillar *Malacosoma disstria* Hbn., in northern Minnesota.** *Tech. Bull. Minn. agric. Exp. Sta.* No. 148, 1941. pp. 55.

The forest tent caterpillar (*Malacosoma disstria* Hbn.) is periodically a pest of deciduous trees in many parts of the United States and Canada. An outline of the life history of the moth is given, with particular reference to its seasonal activities in Minnesota. The principal host appears to be *Populus tremuloides*, but *Acer saccharum*, *Tilia americana*, *Quercus borealis*, *Q. macrocarpa*, *Betula papyrifera* and *Ulmus americana* are also readily attacked. Red Maple (*Acer rubrum*) seems, however, to be consistently avoided by feeding caterpillars, although its leaves are sometimes used by the larvae when constructing their cocoons. Various

methods of making population surveys are described (the results of the 1936–38 surveys being given), and a method is indicated whereby the amount of defoliation probable in the following year may be predicted on the basis of an egg survey and a knowledge of tree characteristics. Control may be brought about by a variety of natural forces such as unfavourable temperature conditions or the action of parasites.

45.3 (71.4) : 13.2. LAMBERT, R. Les insectes forestiers du Québec en 1941. [**Forest insects of Quebec in 1941.**] *Repr.* from *Naturaliste Canadien* 69 (8/9), 1942. pp. 46. [F.f.]

Analysis of the forest insect situation on the basis of 6,574 specimens collected on the principal tree species by fire guards of local forest-protection organizations. There has been a diminution in the *Diprion polytomum* population as compared with 1940, due mainly to a micro-organic disease to which the larvae succumb. *Archips fumiferana* was epidemic on conifers in the west of the Province, causing up to 50 per cent. defoliation in some localities.

45.3 : 13.2. THALENHORST, W. Der Zusammenbruch einer Massenvermehrung von *Diprion pini* L. und seine Ursachen. [**The collapse of an outbreak of *Diprion pini* and its causes.**] *Z. angew. Ent.* 29, 1942 (367–411). [G.g.] [Institut für Waldschutz, Eberswalde.] I.I.E.

The outbreak of *Diprion pini* in northern Germany in 1939–40 gave an opportunity for the study of variations in population of this pest, particularly in the stage of retrogression. The first signs of abatement appeared during the first generation in 1940 in the form of larval diseases, predators, and egg parasites. The final collapse of the outbreak came in 1941, at the egg stage of the second generation, as a result of an epidemic of egg parasites (*Chalcididae*) and the action of predacious bugs. Mortality in the cocoon stage was low in comparison with the total mortality, and the use of parasites and predators as controlling factors at this stage does not appear to be of much value. The only non-biotic factor that influenced the decline of the outbreak was extreme exposure to sunshine which killed many larvae.

45.3 : 13.2. WILKES, A. **Notes on the laboratory propagation of three European species of *Exenterus* (Ichneumonidae), parasitic on sawflies.** *Annu. Rep. ent. Soc. Ontario 1941*, No. 72, 1942 (41–4). [Dominion Parasite Laboratory, Belleville, Ontario.] Biol. Abstr. 17 (3234).

45.3 : 12.25 : 13.2. MORRIS, R. F. **The use of frass in the identification of forest insect damage.** *Canad. Ent.* 74, 1942 (164–7). [Dominion Entomological Laboratory, Fredericton, N.B.] I.I.E.

Reliable means of differentiating the frass of various forest defoliators would help materially in the identification of the particular insect or insects responsible for leaf damage, especially when inspection must be carried out late in the season when the larvae are no longer on the trees. The density of larval population may also be assessed by means of frass collections. Decline in the rate of frass drop after the application of control measures provides an index of the degree of control effected. A frass key is given for certain Spruce defoliators.

45.3 : 12.25 : 13.2. Les Chermes du sapin *Dreyfusia nüsslini* et *Dreyfusia piceae*. [**The Fir chermes *Dreyfusia nüsslini* and *Dreyfusia piceae*.**] *Ann. Éc. nat. For.* 8 (1), 1941 (103–7 + plates). [F.] Biol. Abstr. 17 (7350).

D. nüsslini has one sexual generation on *Picea orientalis* and one parthenogenetic generation on Fir, mostly on *Abies pectinata*. The insects attach themselves to the needles which become curled, wither away, and die; eventually the tree is killed. *D. nüsslini* is a dangerous pest in Fir stands at low altitude, especially if these are exposed to great heat. It can be controlled by a 5-per-cent. lysol spray. *D. piceae* attacks the bark of young Firs, but it is less noxious than *D. nüsslini*.

45.3 : 12.25 : 13.2. Le Lophyre du pin et le Nemate de l'Epicéa. [**The Pine *Lophyrus* and the Spruce *Nematus*.**] *Ann. Éc. nat. For.* 8 (1), 1941 (81–6). [F.] Biol. Abstr. 17 (7349).

The life-cycles of *Diprion* (*Lophyrus*) *pini* and *Nematus abietinus* are outlined and chemical control is discussed.

45.3 : 12.25 : 13.2. GÖSSWALD, K. Beobachtungen über den Schutz eines Kiefernbestandes vor der Kiefernbuschhornblattwespe *Diprion* (*Lophyrus*) *pini* L. durch die rote Waldameise. [**Observations on the protection of a Pine stand from the Pine sawfly *Diprion* (*Lophyrus*) *pini* L. by means of the red ant.**] *Z. Forst- u. Jagdw.* 72, 1940 (370–8). [G.] *Abstr.* in *Z. PflKrankh.* 52 (420). I.I.E.

In an old Pine stand in Prussia that was heavily infested with *Diprion pini* L., complete defoliation was prevented by a strong colony of *Formica rufa rufo-pratensis* within a radius of 300–500 yards from the nest. In another stand the introduction of *F. rufo-pratensis minor* resulted in the control of the next generation but one of the sawfly. The species *rufo-pratensis* is particularly suitable for sawfly control as, like *D. pini*, it prefers open stands.

45.3 : 12.25 : 13.2. **New chemical spray controls Western Pine bark beetle.** *Agric. News Letter* (*Du Pont*) 10 (5), 1942 (106–7). Biol. Abstr. 17 (10421).

A new and highly effective chemical spray for the control of bark beetles on certain species of Western Pine will (when available in quantity) eliminate the hazardous and expensive method of destroying immature broods by fire. Orthodichlorobenzene, a chemical used in the spray, is in demand for war purposes, so that widespread use may not be feasible for some time to come. When mixed with 4 parts of diesel oil this chemical kills the insects on thin-barked trees.

45.3 : 12.25 : 13.2. UNITED STATES. **Seventh annual report of the Rocky Mountain Forest and Range Experiment Station, 1942.** Rocky Mt. Forest and Range Exp. Sta., Fort Collins, Colorado. [1943?] pp. 36 + iii + plates.

Penetrating oils have been successful in treating Lodgepole Pine infested with the Black Hills beetle (*Dendroctonus ponderosae*), the trees being felled and limbed and the oil applied with a hand sprayer. The formula used is 1 part orthodichlorobenzene to 6 parts fuel oil (p. 35).

45.3 : 12.25 : 13.2. BALCH, R. E. **European Spruce sawfly in 1942.** *Pulp Paper Mag. Can.* 44, 1943 (279, 281–2).

Brief report on research for the year, during which further decreases are reported in the European Spruce sawfly (*Gilpinia hercyniae*) population in Canada.

45.3 : 12.25 : 13.2. BENASSI, L. La lotta contro la processionaria del pino. [**The fight against the Pine**

processionary moth.] *Ric. For. Ital.* 2, 1940 (21–6). [Ital.] *Abstr.* in *Z. PflKrankh.* 52 (333). I.I.E.

The Pine processionary moth (*Thaumatopoea pityocampa*) causes much damage in the Varese forests in northern Italy. During the period 1928 to 1935, 1·5 million caterpillar masses were destroyed. Control is difficult and the author recommends the introduction of suitable parasites and of the predator beetle *Calosoma sycophanta*.

45.3 (485) : 12.25 : 13.2. Butovitsch, V. Studier över granbarkborrens massförökning i de av decemberstormen 1931 härjade skogarna i norra Uppland. **[Studies on the mass outbreak of *Ips typographus* in the forests of north Uppland affected by the storm of December 1931.]** *Medd. Skogsförsöksanst. Stockh.* 33, 1940–41 (297–360). [Sw.sw.g.] E.F.A.

An account of observations on the development of outbreaks and the damage caused, during 1933–35 in a number of Spruce forests, as related to the rate of salvage of storm-thrown timber in these forests. In woods where the salvage work had been completed by spring, 1932, standing trees were not, as a rule, attacked but in the other woods the damage was often severe.

45.3 : 12.25 : 13.2. Deubner, W. Der grosse Fichten-Borkenkäfer *Ips typographus* und die Möglichkeit seiner Bekämpfung. **[The large Spruce bark beetle *Ips typographus* and the possibility of its control.]** *Dtsch. Forstztg.* 9, 1940 (90–1). [G.] *Abstr.* in *Z. PflKrankh.* 52 (333). I.I.E.

If the bark is removed immediately after trees are felled, the spread of *Ips typographus* is encouraged. Large numbers of the beetles leave the trunk at the time of felling but usually return during the next twenty-four hours. If, in the meantime, the bark has been removed, the beetles seek out new, previously uninfected Spruce trees. Barking should therefore take place not earlier than 2 to 3 days after felling.

45.3 : 12.25 : 13.2. Hardy, G. A. **Notes on some wood-boring beetles of Saanich, Vancouver Island, B.C. (Coleoptera, Cerambycidae & Buprestidae).** *Proc. ent. Soc. B.C.* 39, 1942 (9–13). [Provincial Museum, Victoria, B.C.] I.I.E.

In a district where trees had been felled in order to make a new road through forest and bush land, 31 species of Cerambycidae and 10 of Buprestidae were discovered among the stumps, logs and slash of the newly-cut wood. One of the few common beetles met with, and probably the most important species from an economic aspect, was *Monochamus oregonensis*. The Buprestidae were generally more abundant, particularly the species *Melanophila drummondi*. The most attractive host trees appeared to be Douglas Fir and Grand Fir. An annotated list of the insect species is included.

45.3 : 12.25 : 13.2 : 13.14. Jung, W. Beiträge zur Kenntnis der Lärchenminiermotte (*Coleophora laricella* Hb.). **[Contributions to the knowledge of the Larch case-bearer (*Coleophora laricella* Hb.).]** *Z. angew. Ent.* 29, 1942 (475–517). [G.g.] R.A.E. A31 (123).

Observations were made on the life history of *Coleophora laricella* in the course of an outbreak on *Larix leptolepis* and *L. decidua*. The immature stages are described. The larvae are little affected by unfavourable weather conditions, but are attacked by parasites and fungi. The trees are resistant to attack, but infestation for several years results in loss of growth and weakens the trees, which become more susceptible to diseases. Control is difficult, and though effective insecticides exist, their cost renders them uneconomic. Silvicultural practices that increase the resistance of the trees are recommended.

45.3 : 12.25 : 13.2. Linsley, E. G. **A new species of *Callidium* from the Coast Redwood, *Sequoia sempervirens* (Coleoptera, Cerambycidae).** *Pan-Pacif. Ent.* 18, 1942 (192). R.A.E. 31A (184).

Callidium sempervirens, sp. n., recorded on *Sequoia sempervirens* in California.

45.3 : 12.25 : 13.2. Struble, G. R. **Biology of two native coleopterous predators of the Mountain Pine beetle in Sugar Pine.** *Pan-Pacific Ent.* 18, 1942 (97–107 + plate). [U.S.D.A. Bureau of Entomology and Plant Quarantine.] I.I.E.

Investigations on the life history and behaviour of *Temnochila virescens* (F.) (Ostomatidae) and *Enoclerus sphegeus* (F.) (Cleridae), which are important predators of bark beetles on most of the western Pines, and to some extent of those on White Fir, Red Fir and Douglas Fir. *T. virescens* is also associated frequently with bark and wood borers infesting Incense Cedar and some hardwoods, including Oak. In Sugar Pine stands both predators are closely associated with the Mountain Pine beetle, *Dendroctonus monticolae* Hopk., *T. virescens* being most active in the summer, and *E. sphegeus* in the fall. Thus the two predators develop independently on the two seasonal broods of the beetle, and competition is avoided.

45.3 : 12.26–8 (64) : 13.2 : 13.14. Bleton, C. A., and Fienzet, L. Les parasites du peuplier au Maroc. II. Sur la biologie de *Paranthrene tabaniformis*, Rott. var. *intermedia* Le Cerf (Lepidopt. Sesiidae). **[Parasites of Moroccan Poplar. II. On the biology of *Paranthrene tabaniformis* Rott. var. *intermedia* Le Cerf (Lepidopt. Sesiidae).]** *Bull. Soc. Sci. nat. Maroc* No. 20, 1940 (57–9). [F.] Biol. Abstr. 17 (10414).

This species is abundant on Black Poplar in the region of Fés. The first moths appear in the beginning of April. Egg-laying begins 3–4 days after emergence, and the incubation period averages 4 to 6 days. The young larva bores through the bark and feeds on the xylem and cambium. A gall is almost invariably formed at a bud, and the branch hypertrophies around the entrance hole. The gallery may be projected upward or downward. Pupation does not exceed one week. The moths emerge from the killed bud or from any point of the branch. They feed on viscous secretions of the extremity of the branches and buds. The average life of laboratory-bred adults is 13 to 14 days.

45.3 : 12.26–8 : 13.2. Braithwaite, J. D. **Notes on research into the parasite of the beehole borer of Teak.** *Emp. For. J.* 21, 1942 (120–2).

Previous to the work described in this paper it was believed that parasitism of the beehole borer (*Xyleutes ceramica*) by *Nemeritis tectonae* was not an efficient method of control as percentage parasitism appeared to decrease with height and age of tree. However, from the evidence presented there appears to be a definite relation between parasitism and the crown: where parasitized beeholes in the crown were considered in relation to total beeholes in the crown, the decrease in attack with age and height was not so marked.

The author describes some successful laboratory experiments in the breeding of *N. tectonae*, the first

ever undertaken with this species. It is suggested that the alternate host of *N. tectonae* may be *Intarbela* sp.

45.3 (73) : 12.26–8 : 13.2. FELT, E. P. **The gypsy moth threat in the United States.** *Circ. E. Plant Bd.* No. 1, 1942. pp. 16. [Bartlett Tree Research Laboratories, Stamford, Conn.]

This pamphlet outlines the history of the gypsy-moth (*Porthetria dispar*) problem in the United States and indicates the present position. The barrier zone, which was established in 1923, has protected 24 important Oak-producing states from the pest, and the importance of maintaining the barrier is emphasized.

45.3 : 12.26–8 : 13.2 : 12.21. MOOK, P. V., and WOLFENBARGER, D. O. **Distribution of *Beauveria bassiana* on Elm insects in the United States.** *Phytopathology* 33, 1943 (76–7). [Bureau of Entomology and Plant Quarantine, U.S.D.A.]

The fungus *Beauveria bassiana* (Bals.) Vuill., is widely distributed in North America and is found on numerous hosts. It has been isolated from the adults of the following Elm insects:—*Scolytus multistriatus* Marsham, *Hylurgopinus rufipes* (Eich.), *Magdalis barbita* (Say), *M. armicollis* (Say), *Saperda tridentata* Oliv. and *Tremex columba* (L.). *S. multistriatus* and *H. rufipes* are both important as carriers of the Dutch Elm disease pathogen.

45.3 : 12.26–8 : 13.2. PINKUS, R. **Ash trees threatened by Lilac borers.** *J. N.Y. bot. Gdn.* 43, 1942 (294–6).

Examination of the trunk of a large specimen of Green Ash (*Fraxinus pennsylvanica lanceolata*), which showed poor foliation in the spring of 1941 and died during the following winter, revealed the presence of numerous holes about a quarter of an inch in diameter, obviously caused by borers. Several specimens of the common White Ash (*Fraxinus americana*) were also found to be infested, although the damage did not become apparent until the late spring of 1942. The insect responsible proved to be the lilac borer (*Podosesia syringae*). Control of this insect is difficult: plugging of the holes during the period of pupation has not yet been thoroughly investigated, but in cases of heavy infestation, control may have to be left to the natural enemies of the insect. All stages of *P. syringae* are described briefly.

45.3 : 12.26–8 : 13.2. WAHL, B. Wald- und Weinbeschädigung durch die Buchenwaldheuschrecke. **[Damage to forest and vineyard by the Beech locust.]** *Z. PflKrankh.* 52, 1942 (382–9). [G.] [Biologische Reichsanstalt für Land- und Forstwirtschaft, Wien.] I.I.E.

Records damage done in different parts of Austria from 1858 onwards by *Podisma alpina* Koll. var. *collina* Brunn. Generally Beech suffered most severely in these attacks, but other species such as Ash, Sycamore, White Beam (*Sorbus aria*), Alder, Hazel, Oak, Birch and occasionally conifers and herbaceous plants were affected.

45.3 : 12.26–8 : 13.2. WHITTEN, R. R. **Toxic and repellent sprays for the control of Elm bark beetles.** *Circ. U.S. Dep. Agric.* No. 647, 1942. pp. 12. [Bureau of Entomology and Plant Quarantine, U.S. Department of Agriculture.]

Naphthalene flakes, crude orthodichlorobenzene, chlorinated naphthalene, diphenyl flakes, and pentachlorophenol were tested for their repellency or toxicity to *Scolytus multistriatus* and *Hylurgopinus rufipes*. In comparison with untreated controls, applications of these mixtures gave reductions in emergence per 100 mm. of egg gallery of from 68·4 to 100 per cent., and a number of the mixtures gave reductions in the number of egg galleries per log of from 75 to 100 per cent. Best results were obtained from spraying when the air temperatures were above 50° F. Repellent sprays were found to be effective for the entire active season.

5. MENSURATION. INCREMENT. YIELD

52. MEASUREMENT OF TREES AND TIMBER

52.4. *Measurement of Volume*

52.43.3 (485) : 12.25 : 12.26–8. NÄSLUND, M. Funktioner och tabeller för kubering av stående träd. Tall, gran och björk i norra Sverige. **[Functions and tables for use in determining the volume of standing timber. Pine, Spruce and Birch in northern Sweden.]** *Medd. Skogsförsöksanst. Stockh.* 32, 1940–41 (87–142). [Sw.sw.g.] E.F.A.

As a result of the investigations described, empirical functions were derived which made possible the calculation of the breast-high form factor and the volume, either under or over bark, of individual Pine, Spruce, and Birch trees in northern Sweden. In order to satisfy different requirements in precision, simple functions as well as more differentiated functions were derived. The former, in which diameter and height are the only variables, were used in elaborating the volume tables presented in the paper.

52.43.4 : 01.7. DAVEY, R. **The number of sample trees required for determining volumes of woods with various degrees of accuracy.** *Forestry* 16, 1942 (52–5).

In order to investigate the required number of sample trees to be measured for a given standard of accuracy, 422 trees from 16 plantations were measured on the ground. The numbers of sample trees required for a 21 to 1 chance of a total volume within 6 per cent. and 8 per cent. of the true volume were determined for both hardwoods and conifers.

52.46 : 01.4. NÄSLUND, M. En ny metod för bältesbreddens uttagande vid linjetaxering. **[A new method for determining the strip-breadth in line surveying.]** *Medd. Skogsförsöksanst. Stockh.* 32, 1940–41 (75–86). [Sw.sw.e.] E.F.A.

It is pointed out that in line surveying or cruising the tendency in the majority of cases is to underestimate the strip width with the result that the tally or estimate of growing stock is less than it should be. In order to reduce this source of error the author developed a new method for determining strip width [cf. *Skogen* 21, 1934 (490–1, 508)], and with certain modifications it is now being used in Swedish forest survey work. In this method the compassman's drag-rope or chain is regarded as one boundary of the survey strip (the left in direction of survey) and the other boundary is established by a special member of the crew (right line-man) who walks a little behind the compassman and as far as possible parallel to the left boundary and 10 m. (width of strip) to the right of it. Longitudinal measurements

are determined from the left drag-rope or chain, and at certain intervals (not fewer than 3–4 per km. of surveyed line) the distance between the ropes is taken, from which measurements the real average width of survey strip is obtained, and the line-man checks his ocular measurement. The greater efficiency made possible by this method largely compensates for the cost of the extra man. Results from the 1939 National Forest Survey showed that strip width varied little with changes in tree diameter and no definite trend could be observed.

56. INCREMENT

56 : 12.25 : 12.11.3 : 21.64. MUNGER, T. T., and MORRIS, W. C. **Further data on the growth of Douglas-Fir trees of known seed source.** Pacific Northwest Forest Exp. Sta., Portland, Oregon. 1942. pp. 12.

A supplement to *Tech. Bull. U.S. Dep. Agric.* No. 537 ('Growth of Douglas Fir trees of known seed source') recording the history of experimental plantations grown from 2-year-old seedlings of known parentage transplanted in 1915. The remaining seedlings were formed into companion plantations in 1916. Data are given on the survival and height of the trees, and an analysis is made of the relationship between height growth and parentage and between planting site and growth irrespective of parentage. The seed originated in localities typifying various climates and soils, and the mother trees represented a variety of contrasting conditions, e.g. young, middle-aged and old trees; open-grown and forest-grown trees; sound and 'conky' trees.

56.02 : 12.26–8 (77.2). FRIESNER, R. C. **Dendrometer studies on six species of deciduous trees in Indiana for 1941.** *Abstr.* in *Proc. Indiana Acad. Sci. 1941* 51, 1942 (74). [Butler University.] A.P.B.

Data are given on the radial growth during 1941 of specimens of *Fagus grandifolia*, *Ulmus fulva*, *Quercus alba*, *Acer saccharum*, *Ulmus americana* and *Fraxinus americana*.

56.02 : 12.25 : 11.44 : 34.21. JEMISON, G. M. **Effect of litter removal on diameter growth of Shortleaf Pine.** *J. For.* 41, 1943 (213–4). [Appalachian Forest Exp. Sta.]

Measurements show that the removal of litter down to the mineral soil over a period of 12 years resulted in slower growth in Shortleaf Pine (*Pinus echinata*) trees of 10·3–13·0 in d.b.h.; this is considered to be of little practical importance.

56.2 : 12.25 : 57.9 : 65.7. BRIEGLEB, P. A., and GIRARD, J. W. **New methods and results of growth measurement in Douglas Fir.** *J. For.* 41, 1943 (196–201). [Pacific Northwest Forest Exp. Sta., and U.S. Forest Service, Washington, D.C.]

The authors describe a new field technique of growth measurement on temporary plots for use as a basis in making growth estimates, and give a preliminary analysis of results obtained in its application in the Douglas-Fir region during the summer of 1941.

57. DEVELOPMENT AND STRUCTURE OF STANDS YIELD

57.4 : 07.7. EATON, C. B., and HALL, R. C. **A mobile paint spray outfit for numbering trees.** *J. For.* 41, 1943 (64–6). [U.S. Bureau of Entomology and Plant Quarantine.]

The outfit consists of a small petrol engine, a diaphragm-type compressor, a length of air hose, and a paint spray gun of the bleeder type. The engine and compressor are mounted on a wheelbarrow-type chassis the back of which is provided with a shallow box for holding the hose and paint gun. The outfit weighs 63 lb. and can be operated by one man. On sample plots of Ponderosa Pine in California it was found that 1 quart of paint is sufficient to number 500–600 trees and that one man can number 75–100 trees per hour.

57.9 (48) : 12.25 : 64 : 24.21. EIDE, E., and LANGSAETER, A. Produksjonsundersökelser in granskog. [**Growth investigations of Norway Spruce forest.**] *Medd. norske Skogforsøksv.* No. 26 [Vol. 7, No. 3], 1941 (360–500). [Nor.g.] N.D.A.

Yield tables have been developed from data obtained on 79 sample plots in naturally regenerated stands in eastern Norway up to 500–600 m. above sea-level and in Tröndelag and part of Nordland up to 250 m. above sea-level. There are in all, fifteen tables differentiated according to five quality classes (boniteter) and three degrees of thinning for each quality class. The quality classes are separated on the basis of average tree height at 50 years of age in closed stands that have been treated with a medium thinning. Average heights for each quality class are:—class A—20 m., class B—17 m., class C—14 m., class D—11 m., and class E—8 m. [It may be noted that these heights are lower than those shown in the Yield Tables of the Forestry Commission of Great Britain by amounts varying from 20 per cent. for quality class A to 38·5 per cent. for class E.]

Degrees of thinning are indicated by the total basal area removed. Thus a medium thinning (class II) removes 10 per cent. more basal area than does a light thinning (class I). The principle followed in thinning Norwegian forests since 1921 has been to leave the best trees distributed as regularly as possible in the stand.

Information given in each table includes number and average age of trees measured, basal area, average height, volume (o.b. and i.b.) of standing and felled trees, annual height and diameter increment, and volume increment in cu. m. and per cent. Basic data used in the construction of the yield tables are given in the form of graphs, formulas and subsidiary tables.

Although the authors state in the preface that the tables are 'imperfect' and cannot be used to answer many questions on the influence on growth of different systems of thinning, nevertheless this publication is bound to be of considerable importance in the future treatment of Norwegian forests. FINN FROST.

6. MANAGEMENT. WORKING PLANS. SURVEYS

60. GENERAL LAND MANAGEMENT

60.3. *Management of Different Classes of Forest*

60.3 (81). OLIVEIRA, A. P. DE. Atividades [*sic*] do serviço de inspeção florestal nó Estado de Pernambuco. [**Activities of the forest service of the State of Pernambuco.**] *Bol. Agric., Pernambuco* 9, 1942 (124–40 + plates). [Port.] [Secção de Botânica do Instituto de Pesquisas Agronômicas.]

60.3 : 11.62 : 91.1 : 91.3 : 96 : 23.3 : 34.3. **Development of forest and wildlife resources.** Tennessee Valley Authority. 1943. pp. 8.

The policy and work of the Tennessee Valley Authority are outlined. The Authority is concerned with forestry and other conservation problems as they

relate directly to the water-control programme. Efforts are being made to promote increased timber utilization for essential war purposes, at the same time avoiding purely destructive exploitation, and to encourage good forestry practices. Watershed protection involves forest-fire control and the prevention and control of soil erosion. Reforestation is carried out mainly with Shortleaf and Loblolly Pines and Black Locust, although other species are used in suitable localities. The transition of the water environment from river to reservoir conditions has generally resulted in increased fish and game production.

60.31 : 22.83.1 : 65.6 : 66 : 32.21. MEYER, H. A. **Management without rotation.** *J. For.* 41, 1943 (126–32). [Pennsylvania State College.]

While the concept of rotation is of fundamental importance in the management of even-aged forests, it has also been used with various modifications for the regulation of uneven-aged forests. However, the structure of a normal uneven-aged forest is fundamentally different from that of a normal even-aged forest and little can be gained by adapting the management methods of one to the other. The practical purpose of regulation in uneven-aged stands is to secure and maintain an adequate balanced growing stock capable of producing a sustained annual or periodic yield, and this can be accomplished without the use of rotation. Disregarding rotation, however, calls for a direct appraisal of the desired normal structure of the forest. This article discusses the problems involved in the appraisal of normal growing stock, the determination of yield, and the establishment of the cutting plan for uneven-aged forests.

60.31 (481) : 22.11. EIDE, E. På vei mot plan og orden i norsk skogbruk. **[Steps towards planning and order in Norwegian forestry.]** *Tidsskr. Skogbr.* 50, 1942 (297–303). [Nor.] N.D.A.

The Director of the Norwegian Forest Research Institute gives a short, concise account of what he considers the best treatment for Norwegian forests. He favours regeneration on larger areas, 50 to 60 yards wide, and is opposed to the selection forest, "blednings-skog," in which trees of all ages and sizes are mixed together. F. F.

60.31 (729.4) : 12.25 : 21 : 98.1. HOLDRIDGE, L. R. **The Pine forests of Haiti.** *Carib. For.* 4, 1942 (16–22). [E.e.span.] [Société Haitiano-Americaine de Developpement Agricole, Port-au-Prince, Haiti.]

The native Pine of Haiti (*P. occidentalis* Sw.) has a wide range in the Republic and is a valuable timber and resin species. Exploitation was started by the Service Technique in 1939 and since October, 1941, 150,000 acres have been turned over to the Société Haitiano-Americaine de Developpement Agricole, which has carried on a programme primarily designed to provide for the timber needs of the country, but also constituting a long-range development plan involving construction of roads, fire protection, mapping, and the necessary investigations for setting up proper management. The first few months of operation indicate satisfactory financial possibilities. *From author's summary.*

60.31.1 (71.1) : 66 : 23.1–2 : 43.1. **Forest management of the 'Coast Islands Working Circle'.** *B. C. Lumberm.* 27 (2), 1943 (24–5, 63–4).

Notes on the policy of intensive management adopted in four provincial forests in the Douglas-Fir belt of British Columbia, comprising about 100,0 acres in all and now grouped into one working circl The immediate objectives of management are:—(1) regulate the cutting of Crown timber so that the tot depletion from fires and logging is within sustaine yield capacity; (2) to study and develop cutting plan in co-operation with timber operators, that will provi for natural regeneration following logging; (3) to co duct a progressive reforestation programme on th more valuable unstocked Crown areas; and (4) to pr vide adequate fire protection and control measures.

60.31.1 (79.7) : 94.11 : 43.1 : 81. **A long range fore program for the State of Washington.** Fore Advisory Committee, Olympia, Washington. 194 pp. 31 + map + dgm.

60.31.2 (71.5) : 97.2. NEW BRUNSWICK. **106th annu report of the Department of Lands and Mines of th Province of New Brunswick for the year ended 31 October, 1942.** Fredericton, N.B. 1943. pp. 13 + plate.

A forest extension service is being organized in Ne Brunswick through the Forest School of the Universit of New Brunswick, with the object of collecting avai able information on cutting methods, utilization, an markets, and making this information available to th owners of small forest areas (p. 13).

60.31.2 (74.7) : 97.2 : 76. COPE, J. A. **Ten years farm forestry on a New York farm.** *J. For.* 41, 194 (169–73). [Cornell University, Ithaca, N.Y.]

An account is given of the practices followed an results obtained in the management, over a period 10 years, of a 15-acre woodlot with an initial stocking 38·5 cords per acre, mostly Oak, Hickory and Har Maple. During this period the owner harvested th equivalent of 214·5 standard cords, about two-fifths which came from reduction of the growing stock an the other three-fifths from an average annual growth 0·8 cord per acre. The total value of the products wa nearly $2,000. This gave the owner an average retur of 86 cents per man-hour for time spent in cutting hauling and trimming the wood, a figure that compare favourably with the returns from other farm activitie

60.31.2 (75.7) : 97.2 : 94.4. BRUNER, M. H. **Recer developments in co-operative farm forestry between th Extension Service and the S.C. State Commission Forestry.** *J. For.* 41, 1943 (186–9). [Du Pont Com pany, Clemson, S.C.]

A brief outline is given of the past history and wor of the South Carolina State Commission of Forestr and the Clemson College Extension Service, and it shown that, with regard to farm forestry, there has bee a certain duplication of effort in the programmes of th two departments. To remedy this situation an agree ment relating to farm forestry work in South Carolin was reached in 1941; this provides for the preparatio of a co-operative farm forestry plan for the State. Th principal points of the agreement and features of th plan are noted.

60.31.2 (75.8) : 97.2 : 94.4. BRYAN, M. M. **Th Coastal Plain Forest-Farming Project in Atkinso County, Georgia.** *J. For.* 41, 1943 (20–6). [U.S. Fores Service, Atlanta, Ga.]

The Coastal Plain Forest-Farming Project wa established in April, 1940. It includes 211,000 acre of which 181,000 acres are in forest, in an area of whic forest products, including naval stores, pulpwoo

lumber, etc., are a principal source of income. The purpose of the project is 'to develop an integrated program of complete land use on individual farms with special emphasis on intensive farm woodland management'. It is jointly financed by the Georgia Division of Forestry and the U.S. Forest Service. The present report describes the area covered by the project and the conditions under which it operates, and gives case histories to show the extent to which the farmers co-operate and the benefits they have received under the project, both in improved forest conditions and increased incomes.

60.31.2 (75.9) : 97.2. **Florida farm forestry.** *Bull. Fla. For. Parks Serv.* No. 14, 1942. pp. 32.

A popular bulletin giving information and advice on the management and marketing of farm woodland crops in Florida.

60.31.2 (76.2) : 24.3 : 23.24 : 33.54. DORMAN, C. **Farm forestry studies by the Delta branch station.** *Miss. Fm. Res.* (*Mississippi Sta.*) 5 (10), 1942. pp. 4. E.S.R. 88 (342).

Information is presented on timber stand improvement, planting trials, and fence post tests.

65. DESCRIPTION OF GROWING STOCK

65.6 : 12.25 : 22.88.2. WELLWOOD, R. W. **Trend towards normality of stocking for second-growth Loblolly Pine stands.** *J. For.* 41, 1943 (202–9). [Duke School of Forestry, Durham, N.C.]

The purpose of this paper is to develop the theory that second-growth stands of Loblolly Pine have a measurable trend towards normality of stocking, with increasing age. The theory is developed from data of temporary sample plots and upheld by data from permanent sample plots. The final algebraic expression developed has the form

$$N = 0{\cdot}324 + 0{\cdot}0040(S) + 0{\cdot}0713(C) - 0{\cdot}0003(SC) - 5{\cdot}537(1/A) - 0{\cdot}0426(S/A) + 1{\cdot}085(C/A) - 0{\cdot}0010(SC/A),$$

where N is normality of stocking, S is site index, C is percentile class, and A is age.

7. FOREST ECONOMICS, VALUATION, AND FINANCE

72. GENERAL PROBLEMS OF PROFIT AND LOSS

72 : 23.24. OPSAHL, W. Litt om skogkulturens lönnsomhet. **[Profits from silviculture.]** *Tidsskr. Skogbr.* 50, 1942 (323–33). [Nor.] N.D.A.

Until recently the forests of Norway have given wealth to the country but very little money has been spent on silvicultural operations including artificial regeneration. With the aid of reliable statistics the author proves that in the long run, plantations are profitable. F. F.

74. VALUE OF THE STAND. VALUE OF THE FOREST

74 : 01.4. THOMSON, R. B. **An examination of basic principles of comparative forest valuation.** *Bull. Duke Univ. Sch. For.* No. 6, 1942. pp. 99.

An analysis of the principles underlying forest statics (defined as 'appraisal of comparative values for proposed enterprises and proposed changes in existing enterprises'). The writer's suggestions regarding the determination of profitableness in forestry follow in the main the principles of the soil rent doctrine.

76. MANAGEMENT STATISTICS

76.1 : 33.02 : 12.25 : 60.31 (76). ZIEGLER, E. A. **Cost of growing pulpwood on Southern Pine land.** *Sth. Pulp Paper J.* 5 (5), 1942 (40, 44, 46, 48). *Abstr.* in *Bull. Inst. Paper Chem.* 13 (143–4). P.O.

A summary is given of the cost of growing Pine pulpwood species (Loblolly, Slash, and Longleaf Pine) on southeastern Pine lands. The basic consideration in all timber growing is protection from fire. Tabulated data are included.

8. ADMINISTRATION

82. LABOUR QUESTIONS

82. **Manpower needs in forestry and associated fields. Report of Committee on War Manpower, Society of American Foresters.** *J. For.* 41, 1943 (159–61).

This report consists of two main parts:—(1) a list of essential war activities in forestry and associated fields, including timber production, wood utilization, range protection and livestock production, and wildlife production and utilization, in which the services of men with at least partial professional training, are required, and (2) specific recommendations for providing the personnel necessary to handle these activities effectively.

82. HURLEY, P. J., and STEVENS, D. R. **The role of a safety committee in reducing woods accidents.** *Pulp Paper Mag. Can.* 44, 1943 (322–4, 334). [Anglo-Canadian Pulp and Paper Mills, Ltd.]

82 : 32.2. LINEKIN, M. G., WHALEN, T. F., SUTHERLAND, J. W., FARRELL, F. J., FEARON, B. H., and SIMPSON, J. H. **Woods labour training.** *Pulp Paper Mag. Can.* 44, 1943 (325–31).

Six papers presented by officers of various pulp and paper companies in eastern Canada discuss the type of labour at present available for woods operations, the training requirements to increase labour efficiency, programmes of instruction that are contemplated or are being undertaken and some of the results so far obtained.

86. ADMINISTRATION REPORTS

86 (71.1) : 98.1 : 82 : 91.8. ORCHARD, C. D. **Chief forester reports to Forestry Committee of B.C. Legislature.** *B.C. Lumberm.* 27 (3), 1943 (37–8, 43).

Timber production in British Columbia for 1942 totalled 3,172 million bd. ft., valued at $123 million.

Recently the problem of forest-fire protection has been complicated by lack of available labour and the enlistment of members of the trained staff. To help solve this problem a labour force of Alternate Service Workers (about 600 in 1942) has been supplied by the Dominion Government. Besides fire-fighting duties and training, these men have been engaged on snag-felling, road improvement work, the preparation of planting sites and planting.

In consideration of post-war rehabilitation problems a brief survey is made of certain projects under the direction of the Forest Service that would give temporary or permanent employment to a minimum of 2,700 men.

9 (729.2). SWABEY, C. **The development of forest policy in Jamaica.** *Emp. For. J.* 21, 1942 (89–100).

The policy programme as prepared for the Government by the Forestry Department is presented in detail under the following main headings:—General Policy, Assessment of Forest Areas, Forest Ownership, Management of Forest Reserves, Research, Extension Services, and Administration.

In general, the fundamental points of policy, as stated, are:—'(*a*) To establish adequate areas of forest reserves under public ownership and to administer them on the basis of conservation and legitimate development for multiple use. (*b*) To encourage throughout the island the conservation of forest, soil, water and wild life resources, and the development of the use of native timbers and other forest produce. (*c*) To undertake necessary research on forest problems'.

90. GENERAL PRINCIPLES OF FOREST POLICY

90 (71). **A statement of forest policy.** *For. Chron.* 19, 1943 (56–63). [Canadian Society of Forest Engineers.]

This statement, which was prepared by a committee of the Canadian Society of Forest Engineers and has been generally approved by that Society, is intended to serve as a basic outline of general policy. Its preparation was governed by the following principles:—(*a*) The fostering of an intelligent and permanent public interest in the wise use of the forest resources is the greatest need of forestry in Canada. (*b*) Adequate forest protection is essential to progress in other directions. (*c*) Plans for improvement in forest practice, if they are to be successful, must take full account of economic realities. (*d*) Details of policy with respect to forest operations, management, research, etc., must be developed on a regional basis. Boundaries of these regions will be dictated by ecological, economic, or administrative factors, either individually or in combination.

The present statement is given under the main headings:—forest protection, forest administration, forest management, economics, public relations and education, and forest research.

90 (72 : 728 : 729 : 8) : 91.7. BEVAN, A. **A forest policy for the American tropics.** *Carib. For.* 4, 1943 (49–53). [E. span.] [Tropical Forest Exp. Sta.]

It is now generally expected that the forest resources of tropical America will become an increasingly important factor in the timber production of the western hemisphere. According to the author a sound forest policy for the countries of the American tropics should be based on the following considerations, in order of importance:—'1. The needs of the local population. 2. Determination of the properties and uses of the more common species for lumber and other wood products for home consumption. 3. The production of "luxury" fancy wood for export'.

90 (729.5) : 23.21 : 97.1. WADSWORTH, F. H. **The evaluation of forest tree species in Puerto Rico as affected by the local forest problem.** *Carib. For.* 4, 1943 (54–8). [E. span.] [Tropical Forest Exp. Sta.]

The chief objectives of forest policy in Puerto Rico should be to improve existing stands, to afforest bare land unsuitable for agriculture, and to supply the considerable local demand for fuelwood, fence posts, poles for house construction, stakes for vegetable crops and tobacco, and similar produce. Groups of tree species are recommended for each of three different planting conditions:—(1) Underplanting in existing deteriorated forests—*Ocotea* spp., *Guarea guara, Hymenaea courbaril, Cerdana alliodora, Montezuma speciosissima, Byrsonima spicata*, and *Lucuma multiflora*; (2) Afforestation combined with agriculture—*Casuarina equisetifolia, Albizzia procera, Sciacassia siamea*, and *Eucalyptus robusta*; (3) Afforestation of poor sites, where it is expected that the plantations will receive little care—*Tabebuia pallida, Calophyllum antillanum*, and *Jambosa jambos*.

91. SOCIAL AND ECONOMIC SIGNIFICANCE OF THE FOREST

91 (54) : 97.1. GARLAND, E. A. **Forestry after the war.** *Indian For.* 68, 1942 (569–75).

In the past forest management has been aimed at maximum financial yield subject to the maintenance of soil productivity. As timber crops acquire a degree of permanence in their locality, those responsible for the future planning of forests should take into consideration the influence they must have on the well-being of the community. Governments should therefore be urged to create without delay boards on the model of the Tennessee Valley Authority as preparation for post-war settlement.

91 (71) : 97.1. BEDARD, A. **Post-war problems and possibilities.** *For. Chron.* 19, 1943 (7–13). [Department of Lands and Forests, Quebec.]

The author discusses briefly projects that could be undertaken in Canada as a basis for developing and using the natural resources of the country to best advantage and as a form of useful and remunerative employment. Projects include stream regulation and water conservation works, the improvement of land accessibility by means of permanent road systems, and an inventory, as complete as possible, of all forest resources of the country.

91 (79.4) : 97 : 60.3. CRAFTS, E. C., and BOLLAERT, R. **Some social and economic effects of timber utilization and management in Modoc County, California.** California Forest and Range Exp. Sta., Berkeley, California. (Revised ed.) 1942. pp. 41 + plates.

A discussion of the contribution of timber resources to the economy of this county.

91.7. *The Forest as a Source of Raw Materials*

91.7 (728.3) : 12.26–8 : 12.19. POPENCOE, W. **Plant resources of Honduras.** *Chron. bot.* 7, 1942 (217–9). O.B.D.

Many regions, especially in the north of Honduras, abound in excellent timbers species, of which *Swietenia macrophylla* is one of the most important for export. *Guaiacum* and *Cedrela mexicana* are also of economic importance, and there are many trees of which the wood is used locally. The mountain slopes of the interior offer excellent scope for reforestation.

91.7 : 33.0 : 98.1. **The new age of wood.** *Fortune* 26 (4), 1942 (117–21, 180, 182–4, 186–8). C.H.

A popular account of recent developments in the use of wood both as a 'direct' material or lumber, and

as a raw material for various conversion processes, both physical and chemical. With these developments, wood is now the raw material characterized by greatest abundance and the widest range of possible uses.

91.8. *The Forest as a Source of Employment and Income*

91.8 (71). **Forestry in post-war rehabilitation.** *For. Chron.* 19, 1943 (14–6).

The report of the standing committee, presented at the 35th annual meeting of the Canadian Society of Forest Engineers. Forestry projects that could well be undertaken and would afford employment after the war include forest protection operations, erosion control, artificial regeneration where necessary, the establishment of provincial and municipal forests, stream improvement, the building of forest roads, and the development of forest colonies. However, the last three projects could be usefully undertaken only if the forests concerned were managed on a sustained-yield basis. It is emphasized that the most important thing in the rehabilitation of men and women from war-time employment is to determine the capabilities and interests of the individuals and to place them in congenial work. Where the work requires housing, feeding and transportation of the men engaged, it is suggested that this should be looked after by the army, while the organization and management of the work done would be entirely in the hands of foresters.

91.8 : 91.2. BRECKON, J. L. **Forestry as an aid to re-establishment after the war.** *For. Chron.* 17, 1941 (126–31).

This paper is concerned mainly with the work and accomplishments of the Civilian Conservation Corps of the United States which offers a good example of the value of forestry in reducing unemployment and might well serve as a guide in post-war re-establishment in Canada.

91.8 (71) : 07.1. COSENS, G. G. **Forestry education and post-war rehabilitation.** With discussion. *For. Chron.* 19, 1943 (53–5). [University of Toronto.]

It is shown that in Canada there is a critical shortage of trained forestry personnel, which will considerably handicap the carrying out of rehabilitation schemes after the war. Suggestions are made for action to improve this situation.

91.8 (71) : 45.3. GRYSE, J. J. DE. **Forest entomology in post-war rehabilitation.** With discussion. *For. Chron.* 19, 1943 (44–50). [Department of Agriculture, Ottawa.]

In order to relate forest entomological work with post-war rehabilitation in Canada, it is suggested that in the first place a survey should be made, province by province, of all existing emergencies and of situations calling for long-term investigations, requirements in connexion with the latter to be used as the basis for a plan of complete reorganization. Work on long-term problems is discussed under the headings (1) distributional studies, which at present are dealt with to some extent by the Forest Insect Survey, and (2) bionomics, for which specialists are needed in a number of subjects.

91.8 (71) : 71. HARRISON, J. D. B. **The economics of forestry in rehabilitation.** With discussion. *For. Chron.* 19, 1943 (17–23).

The author discusses briefly the importance of the forest in Canada's economy, the need for improvement work in the forest, particularly in relation to forest protection, and the value of such work in connexion with the re-establishment of men in the post-war period. It is pointed out that if reconstruction after the war is to be successful, full industrial employment must be reached and that government-sponsored projects should be made use of only as temporary expedients.

91.8 (71) : 44.3. MCCALLUM, A. W. **Forest pathology in relation to rehabilitation.** *For. Chron.* 19, 1943 (39). [Department of Agriculture, Ottawa.]

A brief note on the possibilities of employment in forest pathology in Canada after the war.

91.8 (71) : 43.1. MCEWEN, P. **Forest fire protection in post-war rehabilitation.** With discussion. *For. Chron.* 19, 1943 (24–38). [Department of Lands and Forests, Ontario.]

Forest-fire rehabilitation work is discussed under six main heads as follows:—(1) hazard disposal, including (*a*) safety belts around villages, (*b*) safety belts around roads and railways, (*c*) broadcast burning, and (*d*) winter burning; (2) transportation improvement; (3) communication improvements; (4) insect damage control; (5) mapping and surveying; (6) personnel training. It is suggested that the first steps towards a successful post-war rehabilitation programme would be the appointment of regional forestry rehabilitation committees, the duties of which are outlined.

92. FOREST LAW

92 (79.5) ; 32.21 : 94.3. **1942 Conservation Act survey: Results of field investigations of the Act and recommendations for its improvement.** *Circ. Ore. Bd. For.* No. 6, 1942. pp. 37.

An outline of the merits and weaknesses of the Oregon Forest Conservation Act which regulates cutting practice on privately owned forest lands, together with several recommendations calculated to strengthen the Act.

92 (79.7). **Washington's forestry legislative program: Complete text of Forest Practice Bill.** *W. Cst. Lumberm.* 70 (1), 1943 (27–8).

The Forest Practice Bill is one of three major forestry bills that will be introduced before the Washington State legislature this year. It is defined as 'an Act relating to forestry, prescribing practices to be observed in the harvesting of forest products which will tend to insure future growth, providing for the enforcement thereof, and imposing penalties'.

94. FOREST OWNERSHIP

94 : 60.31.2. STODDARD, C. H. **Some aspects of land tenure as related to forestry.** *J. For.* 41, 1943 (141–2). [U.S. Bureau of Agricultural Economics.]

Land-tenure relationships are of importance to foresters mainly because of their influence on management policies. This note describes briefly certain important forest land tenure relationships the influence of which on land-owner and land-user policies might usefully be investigated.

94.11 (79.4) : 91.8 : 97.1. FRITZ, E. **A proposed system of state forests for California to help solve cutover land and future unemployment problems.** *J. For.* 41, 1943 (162–8). [University of California, Berkeley, Calif.]

The author proposes a system of state forests to be created by purchasing one million acres of California's five million acres of cut-over land. The purpose of this

undertaking would be first to restore productivity to cut-over areas and secondly to absorb post-war unemployed on useful work in establishing and promoting forest growth.

95. FOREST TAXATON

95.1 (79.5 : 79.7) : 94.6. WILSON, S. A. **Comparative tax delinquency and reversion in selected counties of the Douglas-Fir region, 1932–33 and 1940–41.** Pacific Northwest Forest and Range Exp. Sta., Portland Oregon, 1942. pp. 7.

96. POLICY REGARDING PROTECTION FOREST AND DEFORESTATION

96 (7 : 8) : 97.1 : 94. FORSLING, C. L. **Conservation of the forest resources of the Americas.** *Proc. eighth Amer. sci. Congr. 1940* 5, 1942 (95–102). [U.S.D.A. Forest Service, Washington, D.C.]

In this conference paper the author discusses briefly factors on which sound and up-to-date policies are required as a basis for progress in forest conservation and use. These include land-use planning, forest-land ownership, public education in forestry, utilization practices, improved forest management, development of markets, and a trained forestry personnel.

96.3 (213): 11.62.1 : 97.1. : 60. **[Proceedings of the] Commission set up to study deforestation and erosion in tropical countries, under the auspices of the Royal African Society.** Commission of research: Africa (and other tropical countries) 1942. pp. 45. [E.]

96.3 (213) : 11.62.1 : 97.1 : 60. **Commission set up to study deforestation and erosion in tropical countries under the auspices of the Royal African Society.** With comment by H. R. Blanford. *Emp. For. J.* 21, 1942 (101–5).

The Research Commission, under the chairmanship of Professor E. P. Stebbing, Professor of Forestry, University of Edinburgh, consisted of representatives of the British, French, and Belgian Colonies and of the overseas territories of the Kingdom of the Netherlands. At the first three sessions of the Commission, held during the first half of January, 1942, consideration was given to memoranda dealing with (*a*) the results of deforestation, (*b*) the causes of deforestation (shifting cultivation, various kinds of wasteful felling, forest fires, grazing), and (*c*) the remedies for unfavourable conditions. Comments on the proceedings of the first three sessions were submitted by members of the Commission and others qualified to discuss the problems, and included notes on deforestation in the Belgian Congo and in the Netherlands East Indies, notes with special reference to conditions in Nigeria, and a brief account of the causes of soil erosion in South Africa and of the counter measures that have been undertaken there. A summary of the more important points from these comments was presented at subsequent meetings of the Commission.

In its final report the Research Commission 'records its conviction of the serious loss caused to the population of these colonies [British, French and Belgian] and territories [of the Kingdom of the Netherlands] by the progressing deterioration of the soil'. It is pointed out that this deterioration is caused by certain practices that are largely uncontrolled, that in certain tropical regions there is a danger of the complete disappearance of forest vegetation, and that there is need for the early application, by the Governments concerned, of carefully planned methods of control. In this connexion the Commission formulated resolutions dealing with each of the following problems:—(*a*) shifting cultivation, (*b*) bush fires, (*c*) grazing, (*d*) soil erosion and reservation of forests, and (*e*) regeneration of poor or exhausted soils.

The final report and resolutions are quoted in full in the *Empire Forestry Journal* (second title reference above), and these are followed by a critical comment, written by the editor of that journal, on the practical value of recommendations embodied in the resolutions of the Commission, with particular reference to experience in India and the British Colonies.

97. POLICY REGARDING THE RELATION OF THE FOREST TO AGRICULTURE, PASTURE, AND INDUSTRY

97.1 (410). GREAT BRITAIN. **Ministry of Works and Planning: Report of the Committee on land utilisation in rural areas.** H.M. Stationery Office, London. 1942. pp. vi + 138.

97.1 : 01.3 : 94. STODDARD, C. H. **Classification of forest land enterprises.** *J. For.* 41, 1943 (142–3). [U.S. Bureau of Agricultural Economics.]

Two classifications of forest land enterprises are outlined, the first according to type of ownership and the second according to owner's objectives and intent. The latter classification is divided in the first place into two main groups separating ownerships according to whether permanent land use or short-term exploitation is the objective, and secondly into sub-groups separating ownerships in which timber production is a primary objective from those in which it is of secondary or incidental importance.

97.1 (54.5) : 97.3 : 11.62. GORRIE, R. M. **Land management in the Punjab foothills.** Superintendent, Govt. Printing, Lahore. 1941. pp. V + 78 + xii.

The aims of land management in the Punjab foothills are explained, special attention being given to problems of soil conservation. In recent years serious retrogression has taken place in both cultivated and uncultivated land owing to increase in the population, both human and animal. The clearing of woodlands has resulted in erosion and soil deterioration, while in some districts unlimited free grazing has caused the destruction of much potentially valuable forest land. The real importance of forests as regards climate lies not so much in their ability to induce rainfall, as in their making possible the better use of the existing rainfall by reducing floods and preventing rapid runoff. Constant heavy grazing, particularly during the driest periods, leads to the thinning out of vegetation and to compacting of the soil so that the reduced cover is less capable of checking surface runoff and the altered soil profile is less capable of absorbing the water. The supply of water in wells and permanent springs depends on the 'sponge' action of the soil which is best under a canopied tree forest with a deep undisturbed layer of rotting leaves on the ground. This 'sponge' action is not possible where the top soil has been worn off by erosion. Excessive tree lopping for fodder, fire, browsing, and heavy fellings all tend to reduce the capacity of forests for dealing with rainfall. Regulations preventing excessive grazing, especially in young plantations, and the indiscriminate lopping of fodder trees must be enforced. The

establishment of village plantations should be encouraged, but instruction of the villagers in the principles of forest management is an essential preliminary step. Failure of previous attempts at village control may be traced to lack of such instruction.

97.1 (81). RHOAD, A. O. **Land uses and trends in central Minas Gerais.** *Proc. eighth Amer. sci. Congr. 1940* 5, 1942 (113–7). [Bureau of Animal Industry, U.S. Department of Agriculture.] A.P.B.

97.1 (96.9) : 11.62 : 91.8 : 91.1. COULTER, J. W. **Agricultural land-use planning in the territory of Hawaii.** *Ext. Bull. Univ. Hawaii agric. Ext. Serv.* No. 36, 1940. pp. 124.

The most important rôle of the forest cover in the Hawaiian Islands at the present time is the conservation of water. Trees have been planted on thousands of acres adjoining land used for sugar-cane production, in order to improve the water-absorption capacity of the soil, prevent erosion, and provide work for labourers in the 'off season'. The total area of forest reserves, government and private, in 1938 was 1,055,646 acres, or 25·6 per cent. of the total area of the Islands. Tree planting will be an important phase of land utilization in the future as a means of preventing erosion and of recovering waste land.

97.2 (76). HARTMAN, W. A. **The place of forest land in post-war agriculture of the South.** *Sth. Pulp Paper J.* 5 (3), 1942 (8–10). *Abstr.* in *Bull. Inst. Paper Chem.* 13 (56). P.O.

The importance of proper forest development and conservation in southern agricultural life is stressed, with special emphasis on the fact that the total southern acreage is perhaps the greatest ineffectively used resource of the region. Without the potential forest crops being capitalized, the development of the South is seriously limited.

97.2 : 60.31.2 : 91.8. LOCKARD, C. R. **Viewpoints in farm forestry.** *J. For.* 41, 1943 (16–9). [Southern Forest Exp. Sta., New Orleans, La.]

The author suggests that the application of forest practice to farm woodlots in the northeastern United States is retarded primarily by the 'viewpoints' held by the owners and farm leaders generally. These include the failure to recognize wood as a crop; lack of appreciation of the true value of woodlot products as compared with other farm products; ignorance as to the actual returns from woods labour; the belief that woods need no care; and the opposite belief that good woods-practice is impossible without the help of a specialist. Evidence is adduced to prove that the woodlot deserves more attention as an integral part of the farm than it has so far received, and that its proper management will considerably increase returns from the farm enterprise.

97.3 (43.6) : 34.21. SCHNEITER, F. Die Waldweidefrage in der ostmärkischen Almwirtschaft. **[The forest pasture question in Austrian mountain pasture economy.]** *Forschungsdienst* 14, 1942 (83–94). [G.] A.P.B.

The author discusses the importance of the problem and past attempts to segregate pasture and forest production where the combination of the two on the same area was economically disadvantageous. At present there is a need in Austria for eliminating forest pasture from some 150,000 peasant holdings, and special legal machinery and elaborate planning are required to accomplish this task.

97.3 (79.4) : 60 : 97.1. **An analysis of national forest range problems in northeastern California.** U.S. Forest Service (Region 5), Berkeley, Calif. 1942. pp. 49 + plates.

98. THE TIMBER MARKET

98 (66.9) : 33.17. KENNEDY, J. D. **Nigerian forestry and the war effort.** *Emp. For. J.* 21, 1942 (131–3).

A brief account is given of some of the developments that have taken place in consequence of war-time demands for timber and other forest products and of the policy of the Nigerian Forest Department. Particular reference is made to the erection and operation of a pilot sawmill [cf. *For. Abstr.* 4 (201)], the objects of which are to raise the general standard of living by providing a cheap supply of sawn timber, to earn revenue for the native authorities, and to serve as a training centre for African mechanics and sawmillers.

98 (7 : 8). FORSLING, C. L. **The future of the forests.** *Agriculture in the Americas* 3 (1), 1943 (13–6). A.P.B.

Reduced productivity of European forests after the war, owing to present overcutting and destruction, and increased wood requirements for both repair work and new construction, should provide an opportunity for the countries of North, Central, and South America to develop a large export trade in lumber. In order that both foreign and local requirements may be satisfied, a comprehensive survey of the forest resources should be undertaken and the management of the forests planned on a sustained yield basis.

98.1 (485) : 33.3 : 91.7. **Swedish forest products.** *Nature, Lond.* 151, 1943 (165).

Notes from a recent lecture by O. Cyren, Director of the Swedish Chemical Office. The most important by-product of Sweden's sulphite pulp production is sulphite spirit, which until recently was the only product recovered. Mixed with petrol, it is important as a motor fuel. The purity of the rectified spirit now surpasses that obtained from grain and potatoes, and it is therefore used also for human consumption. Researches on the possibility of using sulphite spirit as the basis of more highly developed products are being made by a number of concerns including Mo and Domsjo Company. From the black lye obtained in the sulphite pulp process there are produced *inter alia* certain crude acids; the first factory for using this raw product was built at the Bergvik och Ala pulp mill. The sebacic acid produced there, called 'pine fatty acid', is used to replace fat in washing mediums, as a substitute for linseed oil in paints, etc.

The output of charcoal in Sweden has trebled in the last two years or so, mainly due to the extensive use of producer-gas in motor cars; more care is being taken than previously in the recovery of the by-products of carbonization.

The charring of old tree stumps alone gives about 20,000 tons of tar a year. Wood tar is now used as motor fuel for fishing boats in place of crude oil, and has probably saved the Swedish high-sea fisheries from complete stoppage. It is also used for the production of lubricants.

In summing up the situation for the Swedish forest products industry, Mr. Cyren states that in 1941 the Swedish exports of wood stuffs had declined by about one-third, and those of pulp and paper by two-thirds, compared with the pre-war level. But in compensation the forests, by supplying cattle feed, wood fuel, motor

fuel, lubricants, textile material, fatty oils, and a good many other useful products, have saved the country from catastrophe.

98.1 (54.4). RATURI, P. D. **War effort of Tehri Garhwal State Forest Department (1939–1942).** *Indian For.* 68, 1942 (631–4).

Of the 4,500 square miles comprising the Tehri Garhwal State, the resources of which were offered by the Maharaja to the British Government in 1939, 3,544 square miles consist of demarcated reserve forests. A total volume of 14,366,831 cu. ft. of coniferous timber was felled for war purposes during the three years 1939–40 to 1941–42, made up of 7,187,676 cu. ft. of main fellings of Chir (*Pinus longifolia*), Deodar (*Cedrus deodara*), and Kail (*P. excelsa*), 1,034,230 cu. ft. of thinnings, and 6,144,925 cu. ft. of Silver Fir and Spruce. Minor items of importance include resin production and the supply of Walnut and Maple for rifle furniture.

98.1 (68) : 23.3 : 94.11 : 76.2 : 57. CRAIB, I. J. **State afforestation after the war.** *J.S. Afr. For. Ass.* No. 9, 1942 (5–18 + plates).

The author discusses in detail the position in South Africa with regard to (*a*) present and future softwood timber requirements, (*b*) the present and potential production of timber from indigenous forests and from coniferous plantations established and to be established in accordance with the State afforestation programme, and (*c*) the possibilities of expanding this programme in order to meet more fully the future requirements of the country for softwood timber.

The indigenous forests of South Africa are of very limited extent and are made up largely of hardwood species of limited economic importance; nearly 80 per cent. of these forests have been over-exploited, and the annual production of State-owned indigenous forests has fallen from an average of 996,000 cu. ft. in the five-year period 1912–13 to 1916–17 to one of 301,000 cu. ft. in the period 1937–38 to 1941–42.

The introduction of exotics began more than fifty years ago and by 1937 there was a total area of 1,242,310 acres of plantations (324,599 acres belonging to the State and 917,711 acres under private and municipal ownership) including conifers, Eucalypts, Wattles, Poplars and other species. It is pointed out that so far as mining requirements are concerned there is now an adequate supply of Wattle and Eucalypt plantations and that any further planting of these species should be left to private enterprise if and when suitable new markets are developed. The demand for Poplar wood is unlimited but the exacting site requirements of the species will restrict their use in afforestation.

The primary task of national forestry in South Africa is considered to be the production of adequate supplies of coniferous timber to give the country some measure of independence in this regard. From 1920 to 1940, coniferous plantations were established by the Forestry Department at the rate of 12,000–14,000 acres per annum and by 1942 a total of 273,000 acres had been planted and in addition 60,000 acres by private and municipal enterprises. The main species planted were *Pinus insignis* (= *P. radiata*), *P. caribaea*, *P. patula*, *P. montezumae*, *P. pseudostrobus* var. *tenuifolia* (= *P. teocote*), *P. pinaster* and *P. longifolia*.

The volume of coniferous timber imported into South Africa per annum has increased from an average of 12·7 million cu. ft. for the five-year period 1910–14 to one of 28·0 million cu. ft. for the period 1935–39. This increase is approximately at the rate of 4 per cent. per annum, a rate which the author suggests will be maintained for at least the next 50 years; by the end of that period the total annual requirements in log volume will be 200 million cu. ft.

During the year 1941–42 a total volume of 13,000,000 cu. ft. of sawlogs (= about 5,200,000 cu. ft. of sawn lumber) was cut from State (10,000,000 cu. ft.) and private plantations, mainly in the form of thinnings from immature stands. This total is equivalent to about 19 per cent. of the 28·0 million cu. ft. of softwood timber imported annually (estimated average) over the period 1935–39. It is estimated that when the present State planting programme is completed (in 25 years) there will be an area of 590,000 acres under conifers capable of a sustained yield of some 72 million cu. ft. of logs from 1980 onwards. With the yield from private plantations the total will approximate 90 million cu. ft., or less than half the 200 million cu. ft. required at the end of fifty years. Assuming a mean annual increment per acre it is estimated that in order to supply the anticipated demand the goal of State afforestation would have to be 1,450,000 instead of 590,000 acres.

Making certain assumptions as to price of timber and conversion loss, the author shows that there is a big variation in gross income (plantation and sawmill) from plantations on different site qualities and composed of trees having different rates of growth, the ratio of incomes from plantations growing under the best and under the poorest combination of variables being as much as 9 to 1. It is also shown that the value of land for afforestation varies greatly depending on the distance from the railroad.

It is pointed out that if the State is to acquire sufficient land for any considerable expansion of its afforestation programme, it will have to do so by purchase. While in the past the Forest Department has restricted its purchases to cheap land, the author recommends 'that the State should, during the next decade, plan to acquire an additional 450,000 acres of high-quality afforestable land and that after the war, the average pre-war rate of afforestation . . . should be increased to 45,000 acres per annum'. The plan suggested would result in the States' holding coniferous plantations approximately 1,000,000 acres in extent. If only first and second quality land were purchased and the species were carefully selected, the mean annual increment for the additional land might be raised from the present 120 cu. ft. to 280 cu. ft. per acre and the annual production capacity, 50 years hence, for both State- and privately-owned plantations, would then be approximately 200 million cu. ft. in the log.

For reasons discussed by the author it is recommended that where possible, afforestation of unplanted unit areas should be completed on the basis of a five-year planting programme, and thinning operations would then be adjusted to five-year periods, thus enabling sawmills to remain in continuous operation for the better site qualities from the 10th year onwards.

It is concluded that 'if the State invests £10,000,000 in forestry, additional to its current commitments, along the lines indicated, it may confidently look forward, 50 years hence, to its present potential production capacity of softwoods being increased by 150 per cent., to its providing raw material for wood-using industries

(excluding all hardwoods and privately-owned softwoods) with a total output worth £12,600,000 per annum (pre-war wood imports had already risen to £5,000,000 per annum), and to its providing employment, directly and indirectly, for 100,000 employees or for the support of half a million souls. The timber thus produced should be sufficient to maintain 180 mills as large as the largest existing local mill (1,000,000 cubic feet annual capacity), in permanent production'.

98.2 (71.4–6) : 12.25 : 33.17 : 76.1 : 33.91. FELLOWS, E. S. **Some problems of the Spruce lumber industry.** *For. Chron.* 17, 1941 (91–8). [Forest Products Laboratories of Canada, Ottawa.]

Three problems of the Spruce lumber industry of eastern Canada, namely wastage, operating costs and grading, have been brought to the attention of the Forest Products Laboratories (Ottawa) with requests for aid in solving them. The author discusses broadly the nature of these problems, the steps taken to solve them, and the bearing of these problems on forest policy in general. The use of sawmill waste in the manufacture of chemical pulp, the differentiation of logs on the basis of use-value, and the objectives of lumber grading rules are the main topics treated.

98.2 (73) : 98.1 : 33.0. HYLE, R. J. **The effect of war on the production and use of lumber.** *Sth. Lumberm.* 166 (2085), 1943 (41–3). [New York State College of Forestry, Syracuse, N.Y.]

A general discussion of current conditions in the U.S.A.

98.2 (75.5) : 31.0 : 12.25 : 12.26–8. GRANTHAM, J. B. **Wood-using industries of Virginia.** *Bull. Va. polyt. Inst.* 34 (1), 1940. pp. 130.

The bulletin is divided into four parts as follows:—part I discusses briefly the properties and uses of the principal woods marketed in Virginia, giving for some species statistics on the quantities used by different industries, the percentage of requirements grown in the State, and the production cost; part II describes briefly the position and requirements of the various wood-using industries of the State; part III is a directory of the wood-using industries of Virginia by counties and by industries; part IV lists the various uses for each timber species.

98.3 (485). **Sweden's lowest. The wood export sales of 1942.** *Timb. Tr. J.* 164, 1943 (393).

The sales totalled about 365,000 standards—the lowest figure on record for the last 75 years.

98.3 (68) : 33.0 : 07.2. ECKBO, N. B. **Fifteen years' marketing research in South African timbers.** *J. S. Afr. For. Ass.* No. 9, 1942 (48–50).

A brief note on the work of the Forest Products Institute, South Africa, in promoting the use of and markets for timbers, both hardwoods and softwoods, grown in that country.

NOTES FROM THE DAILY AND THE NON-TECHNICAL PRESS

References: 1. *Diario de la Marina*, Havana. 2. *Diário de Noticias*, Lisbon. 3. *Domestic Commerce*, Washington. 4. *Foreign Commerce Weekly*, Washington. 5. *Hamburger Fremdenblatt* (*Morgen-Ausgabe*), Hamburg. 6. *Mañana*, Montevideo. 7. *Nacion*, Santiago. 8. *National Zeitung*, Essen. The numbers in brackets indicate the reference number and the date of publication of the newspapers and journals to which the annotations refer.

Brazil. A forest conservation programme that is being carried out in Brazil includes the enlargement and protection of the State forests, which now total approximately 875,000 acres.

Brazil's imports of coal have been greatly reduced owing to shipping difficulties, and efforts to supply fuelwood for the railroads, to furnish wood for charcoal, and otherwise to offset the acute fuel shortage have resulted in heavy cutting in many forest areas. Considerable quantities of charcoal are used for cooking purposes and in gas producers (4; 13.3.43).

Canada. More than 1,300 million bd. ft. of timber were shipped from Canada to the United States in 1942. This amount is more than double the corresponding shipments in any year from 1932 to 1940, and is also slightly larger than the 1941 figure, even though timber production in Canada in 1942 was lower than in the preceding year, mainly because of labour shortages. Canada expects to furnish 1,000 million bd. ft. of timber to the United Kingdom in 1943 from an estimated output of 4,000 million bd. ft. (4; 20.2.43).

Chile. The Corporación de Fomento de la Produccion (a Government department concerned with the provision of credit and with economic development) has completed the first part of its programme of afforestation on land unsuitable for farming. Some 11,000 ha. have been planted with Pines and Eucalypts, and nurseries with an annual production capacity of 4–5 million plants have been established (1; 3.2.43 and 7; 27.12.42).

One company in Chile is engaged in the manufacture of plywood. The firms owns more than 100,000 acres of forest, with a timber supply estimated to be sufficient for 70 years at the present rate of consumption. The timber consists mainly of *Araucaria* and Coigüe (*Nothofagus* sp.). Production began in 1938 with the plant operating on one shift. In 1939–41 two shifts were employed. From early in 1942 the factory has been operating 24 hours a day and has now reached an annual production of approximately 10,000 metric tons. It employs 1,200 persons. The output is sufficient to meet domestic requirements and leave a surplus for export, which goes mainly to Argentina, though some shipments go to other neighbouring countries. Construction has begun on a smaller plywood factory at Osorno, Valdivia. This plant is being erected under the auspices of the Agricultural Colonization Institute and the Fomento Corporation. It is expected to start operation in February, 1943, and, eventually, to produce 1,800 metric tons annually (4; 6.2.43).

China. An afforestation campaign is being carried on in China, and many Chinese are undertaking to plant at least 15 trees each year. About 9 million trees have been planted so far (**4**; 13.2.43).

German-occupied Eastern Europe. At a meeting attended by representatives of the new company 'Deutsche Gesellschaft für Holzforschung', H. Barth, the chief of the Forestry Department in the Ostministerium, reported on the efforts of German foresters in the Eastern occupied territories and the results so far achieved. He said that the administrative difficulties became ever more complicated owing to the great urgency for getting timber at any price to South Russia and the steppes to meet military and other requirements; these regions are almost devoid of forests, so that to the primary task of obtaining the timber is added the problem of transportation. For this reason and many others not less important, an intensified exploitation of forests could not be considered for the time being, and present efforts had to be directed towards satisfying the most urgent needs. Difficulties of transport included those of hauling the timber from forests to railways, as only relatively small amounts could be handled by horses. The timber was being floated wherever possible, and the first 80,000 solid cu. m. of "Ostholz" had come to the Reich by way of the rivers Duena and Memel. There were also problems of labour shortage to be considered. He stated further that at present over 1,500 sawmills were operating at full capacity, also 20 plywood factories and many other undertakings; all of which supplied the front and the districts behind the front line (**8**; 1.12.42).

According to the *Hamburger Fremdenblatt* (**5**; 29.7.42) the forests of White Ruthenia cover about 2·5 million ha. As a result of excessive exploitation in the year preceding the German occupation and the present urgent need for timber in the country, caused by the destruction during the war, it is hardly to be expected that any considerable quantities can be exported to the Greater Reich in the near future. Within the precincts of the German Civil Administration there are exactly 120 sawmills. The most important by-product of the White-Ruthenian forest industry is resin, while the production of tanning bark takes second place.

Mexico. The Mexico Northwestern Railway Company owns altogether more than 1 million acres of forest land, most of it growing Ponderosa Pine. At Madera this company operates a large sawmill with a monthly output of 2½ million bd. ft. There is also a planing mill, a box factory, and four dry kilns. The total annual production of this plant is approximately 30 million bd. ft., about one-third of which is manufactured into boxes and crates. Some fine timber stands are being exploited at several points near Madera, and supplies also come from Pajarito and Vallecillo. Three sawmills are operated on other timber tracts in the Sierra Madres, near Cumbre. They have a capacity of about 875,000 bd. ft. per month, but, with additional labour, production could be doubled. The company is contemplating the installation of a fourth mill, of larger type, in this area, if the necessary equipment can be obtained. This would mean an additional production of 750,000 bd. ft. per month, working with one shift, or 1½ million bd. ft. with two shifts, and it is estimated that, with a fourth mill, the total production of the Cumbre region could be increased to 20 million bd. ft. annually, using one shift. The company is now constructing a railroad into these timber areas, branching off from the main line at Cumbre. Its completion will make available immediately a considerable quantity of dry lumber, which, because of the poor condition of the roads, has not been moved to a shipping point (**4**; 6.2.43).

Portugal. The 30-year afforestation plan initiated in 1938, which aims at the reclamation of over 500,000 ha. of bare hills, commons, dunes, etc., is reported to be making good progress. So far 9,860 ha. of forest have been planted in sand dunes alone. The present value of Portugal's forest produce is calculated at just over 1,025,000 contos per annum (approximate exchange 1 contos = £10), of which about 570,000 contos are accounted for by Oak products (**2**; 30.1.43 and 4.2.43).

Cork tyres for use with aeroplane landing gear have been tested with satisfactory results (**4**; 13.3.43).

Spain. Because of the difficulty of making shipments abroad, Spain will utilize a large amount of its turpentine and colophony in the manufacture of celluloid, synthetic camphor, and fuel substitutes. A process for making synthetic rubber will also employ turpentine and colophony (**4**; 23.1.43).

Sweden. Sweden supplied Germany with nearly one-half billion bd. ft. of sawn timber during 1942, more than five times the pre-war figure. Exports to Germany in 1939 totalled 89,635,851 bd. ft. In 1942 Denmark took approximately 130 million bd. ft., the Netherlands took 53 million bd. ft., and Belgium about 10 million bd. ft. (**4**; 20.2.43).

Recently a method has been developed for producing a material from wood to be used as a substitute for rubber in bicycle tyres, shoe heels, and plastic products. An experimental plant has been opened at Gislaved in central Sweden to manufacture the new material, which is known as 'telax' (**4**; 27.2.42).

United States. A new plastic made from California Redwood is being used in the manufacture of steering wheels for lorries, buses, tractors, etc. A San Francisco timber company developed the idea of using waste pieces (slab sides, end pieces, and bark) to produce a pulp which is baled and shipped to a company in the eastern States, which turns out 7,000 Redwood plastic steering wheels in an 8-hour working shift. The plastic compound is moulded on a steel wire skeleton (**3**; 25.2.43).

Uruguay. The scope for afforestation work is dealt with in a special article in *Mañana* (**6**; 17.11.42). In 1939 imports of forest products totalled 7,538,200 Pesos (London exchange, 1941, 7·63 Pesos = £1). According to data obtained in 1937, 1,340,800 ha. of land are available for afforestation. The country's present requirements in mechanical pulp could be met indefinitely by growing in suitable localities 6,000–7,000 ha. of Poplar and Willow on a rotation of 10–12 years. *Araucaria angustifolia* and *Pinus insignis* can be grown on a 15-year rotation, and there should be no difficulty in establishing sufficient plantations of these species to satisfy the small requirements in chemical pulp of the newsprint industry, while some 8,000 ha. of *Acacia decurrens* var. *mollis* would supply the internal requirements in tanning substances. The State should collaborate with landowners so as to ensure adequate afforestation.

(4.06) Wt P.1082 250 9/39 G.359 C.&R. Ltd.

SUBSCRIPTION RATES

THE Annual Subscription for *Forestry Abstracts* is:

For residents of the countries of the British Commonwealth and the Anglo-Egyptian Sudan who send their subscriptions direct to the Bureau	20*s.* 0*d.*
For all other subscribers	25*s.* 0*d.*
Single parts, each	7*s.* 6*d.*

All these prices include postage and are payable in sterling. If drafts in other currencies are sent, official or Bank of England rates only can be accepted. Particulars of trade terms will be supplied on request. All enquiries relating to subscriptions should be addressed as indicated at the bottom of the outside back cover.

Correspondence on matters other than the purchase of publications should be addressed to :—The Deputy Director, Imperial Forestry Bureau, 39 Museum Road, Oxford, England.

STAFF OF THE IMPERIAL FORESTRY BUREAU

Director	H. G. CHAMPION, M.A., C.I.E.
Deputy Director	J. W. B. SISAM, B.SC.F., M.F.
Scientific Assistants	MISS A. P. GRAY, M.A., MRS. M. MORRIS, B.SC., PH.D., P. G. BEAK,* I. KISSIN, B.A.
Secretary-Accountant	MISS J. C. BAILEY
Assistant Secretary	MRS. K. DAVIES

This Bureau is one of a group covering scientific information on entomology, mycology, soil science, plant genetics, pastures and forage crops, fruit production, animal health, animal nutrition, animal genetics, helminthology, dairy science and forestry, organized under

THE EXECUTIVE COUNCIL OF THE IMPERIAL AGRICULTURAL BUREAUX
2 QUEEN ANNE'S GATE BUILDINGS
LONDON, S.W.1

* On Active Service.

IMPERIAL AGRICULTURAL BUREAUX

IMPERIAL FORESTRY BUREAU
OXFORD

(See inside back cover)

IMPERIAL BUREAU OF PLANT BREEDING AND GENETICS
CAMBRIDGE

This Bureau covers current literature on the breeding, genetics and cytology of economic plants, and publishes a quarterly journal, *Plant Breeding Abstracts.*

Annual subscription **25/-**, single copies **7/6** each.

IMPERIAL BUREAU OF PASTURES AND FORAGE CROPS
ABERYSTWYTH

This Bureau covers current literature on grassland, forage crop and plant biological research and issues two quarterly publications, *Herbage Abstracts* and *Herbage Reviews.*

Annual subscription: *Herbage Abstracts* **25/-**, single copies **7/6** each.
Herbage Reviews **15/-**, single copies **4/-** each.

Herbage Reviews has been discontinued from December, 1940, until further notice.

IMPERIAL BUREAU OF HORTICULTURE AND PLANTATION CROPS
EAST MALLING

This Bureau covers literature on horticulture, including fruit, vegetables, commercial flower production, the cultivation of tropical plantation crops, and the storage and processing of horticultural products, and publishes a quarterly journal, *Horticultural Abstracts.*

Annual subscription **25/-**, single copies **7/6** each.

IMPERIAL BUREAU OF SOIL SCIENCE
HARPENDEN

This Bureau covers current literature on soil science, and publishes a quarterly journal, *Soils and Fertilizers.*

Annual subscription **25/-**, single copies **7/6** each.

Reduced prices are available to residents of the countries of the British Commonwealth and Anglo-Egyptian Sudan. All correspondence regarding subscriptions to Journals and the purchase of other Bureaux publications should be addressed to Imperial Agricultural Bureaux, Central Sales Branch, Agricultural Research Building, Penglais, ABERYSTWYTH.